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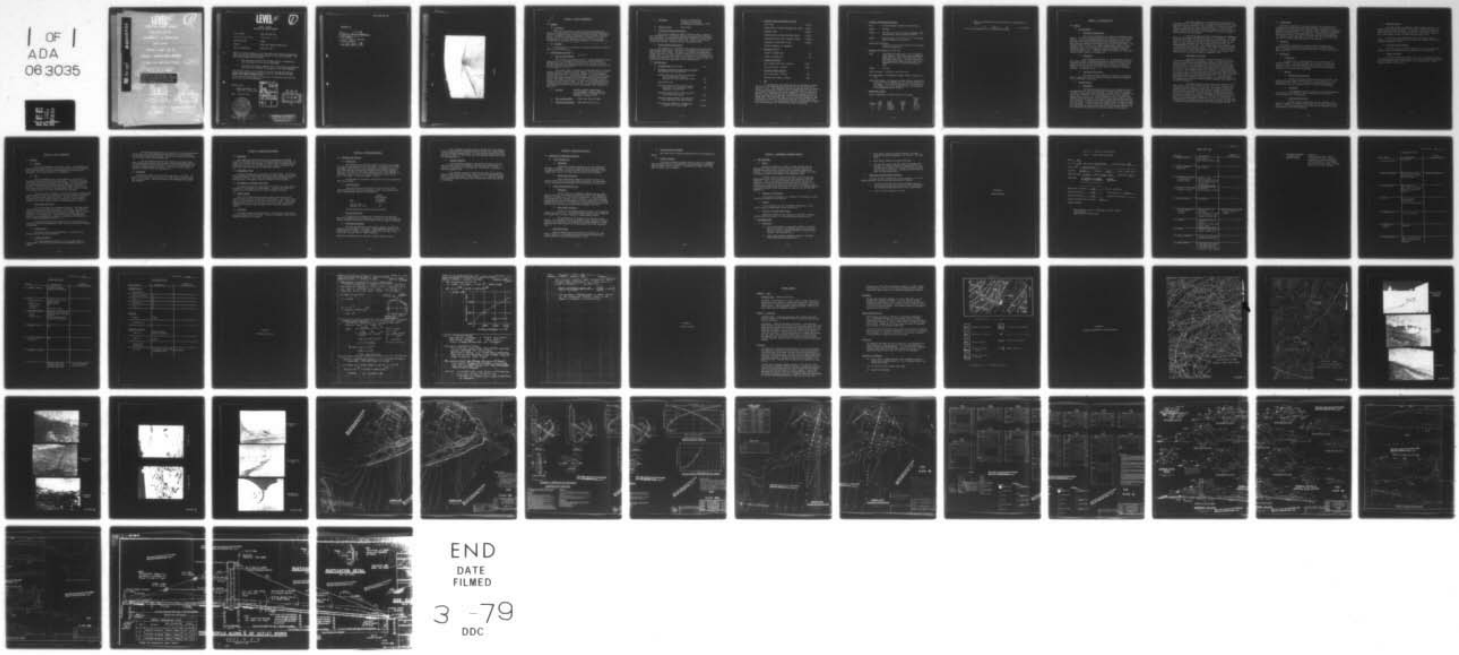

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LEVEL II

POTOMAC RIVER BASIN

LONG PINE RUN DAM

COMMONWEALTH OF PENNSYLVANIA

ADAMS COUNTY

INVENTORY NUMBER NDS 328

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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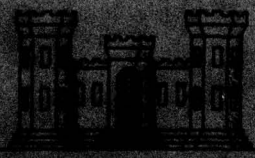
National Dam Safety Program. Long Pine Run Dam (Inventory Number NDS-328), Birch Run, Potomac River Basin, Adams County, Commonwealth of Pennsylvania. Phase I Inspection Report.



Prepared for
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland

411 003

LEVEL II

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	LONG PINE RUN DAM
State and State Number:	PENNSYLVANIA - 1-82
County Located:	ADAMS
Stream:	BIRCH RUN, POTOMAC RIVER BASIN
Date of Inspection:	April 20, 1978

Based on a visual inspection, past performance and available engineering data, the dam and its appurtenances appear to be in good condition. The following recommendations are made:

1. The owner shall inspect the spillway erosion to determine if the retaining wall is or may be undermined.

2. The owner shall repair damaged areas on the downstream embankment and improve the drainage of the gutter at the right abutment.

The spillway capacity is sufficient to pass the recommended spillway design flood (SDF) without overtopping the dam. The SDF for this dam equals the Probable Maximum Flood.

In the event of unusual heavy precipitation an around-the-clock surveillance plan should be implemented.

Submitted By:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

Date: June 15, 1978

APPROVED BY:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 27 Jun 78

OVERVIEW

ABSTRACT

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Dam Inspection Act, Public Law 92-237 (Appendix III) authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspections of dams throughout the United States. The Phase I Inspection and Report is limited to a review of available data, a visual inspection of the dam site and the basic calculations to determine the hydraulic adequacy of the spillway.

b. Purpose

The purpose is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

ABSTRACT

a. Dam and Appurtenances

The Long Pine Run Reservoir Dam is a rolled embankment with an impervious core. The length of the dam crest is 840 feet and the maximum height from the creek bed to the top of the dam is 112 feet. The top of the dam is at elevation 1372.0. For a typical section of the dam see Appendix D, Plate XI.

The control tower is located at the upstream side of the crest roadway, directly accessible from the roadway. All gate controls are located inside the tower. The outlet conduit is a 54 inch diameter concrete pipe with a 24 x 36 inch sluice gate. The spillway is located in the right (west) abutment and has a broadcrested weir at elevation 1360.0. The length of the weir is 130 feet. The spillway chute is excavated in rock and is unlined. It has concrete retaining walls over a relatively short length at the left side. A stilling pool has been excavated into the rock at the end of the spillway chute (Appendix D, Plate XII).

b. Location: Franklin Township, Adams County
U.S. Quadrangle, Caledonia Park, Pa.
Latitude 39°56.3', Longitude 77°27.3'
(Appendix D, Plates I & II)

c. Size Classification: Large (over 100 feet high)

d. Hazard Classification: High (See Section 3.1.e)

e. Ownership: Borough of Chambersburg
100 South Second Street
Chambersburg, Pennsylvania 17201

f. Purpose of Dam: Water Supply

g. Design and Construction History

The dam was designed by Gannett Fleming Corddry & Carpenter, Inc., Harrisburg, Pa. The Permit Application was approved by Pennsylvania Department of Environmental Resources (PennDER) in October, 1968, and construction was started in March, 1969. The Contractor, Green Construction Company, completed the work in November, 1970.

h. Normal Operating Procedures

The reservoir is for domestic water supply for the Borough of Chambersburg, Pennsylvania. Releases to the downstream channel can be made through three intakes. The water is released to the downstream channel from where it flows to another reservoir (Birch Run Reservoir) located about 1.9 miles downstream. This reservoir is also owned by the Borough of Chambersburg, Pa. The actual intake for the water supply is located about one mile downstream of Birch Run Reservoir.

1.3 PERTINENT DATA

a. Drainage Area (square miles)	7.92
b. Discharge at Dam Site (cubic feet per second) See Appendix B for calculations	
Maximum known flood at dam site calculated from recorded pool elevation. September 26, 1975 (Elevation 1361.4)	720
Warm water outlet	50
Diversion tunnel low pool outlet at pool elevation 1,275 from design rating (Appendix D, Plate VIII)	130
Diversion tunnel outlet at pool elevation 1,360 from design rating	470
Ungated spillway capacity at maximum pool pool elevation 1,372 (Top of Dam)	17,700
Total spillway capacity at maximum pool elevation 1,372 (top of dam)	17,700

c. Elevation (feet above mean sea level

Top of dam	1,372.0
Maximum pool of record (September 26, 1975)	1,361.4
Spillway crest	1,360.0
Upstream portal invert diversion tunnel	1,270.0
Downstream portal invert diversion tunnel	1.246.25
Streambed at centerline of dam	1,260.0
Maximum tailwater not available	

d. Reservoir (miles)

Length of maximum pool	1.0
Length of normal pool	0.9

e. Storage (acre-feet)

Water supply pool (Elev. 1,360.0)	5,430
Top of dam (Elev. 1,372.0)	7,490

f. Reservoir Surface (acres)

Top of dam (Elev. 1,372.0)	190
Spillway crest (Elev. 1,360.0)	150

g. Dam

For general plan and typical sections see appendix D, Plates VII and XI. The design drawings indicate that the top of dam has a width of 25 feet. The impervious core has an upstream slope of 1.75H to 1V and is protected by a rockfill with a finished slope of 2.75H to 1V. The rockfill is separated by a Select Random Fill from the impervious material. The downstream slope of the impervious material is 1H to 1V and is separated by a 10 foot wide filter from the downstream zone of random fill. The downstream slope is 2.5H to 1V above elevation 1,300, at which point there is a 30 foot wide berm and the slope below this berm is 3H to 1V. On the centerline of the dam a cutoff trench is shown with a bottom width of 30 feet and three lines of grouting.

h. Diversion and Regulating Tunnels

Type - 54 inch diameter reinforced concrete pipe.

Length - 619 Feet.

Closure - 24 inch by 36 inch sluice gate (emergency draw down facility, invert elevation 1270.0)

Access - 20 foot by 20.5 foot control tower at upstream edge of roadway on top of dam.

Regulating Facilities - 24 inch by 36 inch sluice gate and 16 inch gate valve on by-pass pipe.

i. Spillway (See Appendix D, Plate XII)

Type - Uncontrolled concrete weir of flat triangular cross section. Flat planes slope upstream and downstream from crest. Upstream slope 0.025 downstream slope 0.1761. Concrete extends five feet upstream and downstream from crest line. Remainder of chute is unlined excavation in rock.

Length - 130 Feet.

Crest Elevation - 1,360 feet, mean sea level.

Upstream Channel - Rectangular, unlined channel excavated in rock.

Downstream channel - Rectangular, unlined channel excavated in rock has concrete training wall on left side, for part of its length. It is 800 feet long and has a stilling pool excavated in rock at the downstream end. The elevation at the downstream end is 1,230.0.

j. Regulating Outlets

Water is admitted to control tower by three pipes.

Pipe No.	Size (Ft.)	Invert Elev.	Length (Ft.)	Sluice Gate Size (Ft.)
1	1.5	1,342.25	55	1 x 1.5
2	1.5	1,310.25	142	1 x 1.5
3	4.5	1,270.00	250	2 x 3

Water is discharged from control tower by a single pipe as follows:

4	4.5	1,267.75	325	2 x 3* *Pipe

No.4 is also equipped with a 16-inch by-pass valve.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

a. Data Available

1. Hydrology and Hydraulics

The files of PennDER did not contain any hydraulic calculations. The Permit Application Report indicated that the Q design was 6825 c.f.s. and this discharge would leave a freeboard of over 4 feet. Drawings for the dam were obtained from the Consulting Engineer and these indicate synthesized hydrographs for the years 1930 to 1966. Peak discharge shown is 2114 c.f.s. These drawings also contain an area-capacity curve, a lake area and outlet works discharge rating curves. The design engineer also furnished calculations showing a PMF peak inflow of 14,678 c.f.s., a peak PMF outflow of 13,700 c.f.s. and a top-of-dam spillway capacity of 14,850 c.f.s.

2. Embankment

The information available for the embankment consists of the design drawings, including general plan, typical sections and core borings at the dam and spillway (Appendix D, Plates VII through XIII). Auger borings and test pit information was available on the borrow material. The files did not include stability, seepage or settlement analyses or a geologic report.

3. Appurtenant Structures

The design drawings indicate all details of the control tower, conduit and spillway. Structural design criteria and analyses are not available in the files.

b. Design Features

1. Embankment

The design drawings indicate that the foundation area of the embankment fill was to be stripped, including removal of exposed boulders. On the centerline of the dam, a trench was to be excavated to top of rock elevation. The bottom width was to be 30 feet and side slopes were to be 1H to 1V. It was intended to place 3 lines of grout holes in the trench and the split spacing stage grouting procedures was to be followed. The depth of the grout curtain was to be 40 to 60 feet. The rock strata is shown as fractured sandstone with a decomposed sandy silt overburden. A select random fill separating the upstream rock fill from the impervious material is shown as 24 feet wide and consists of 2 or 3 zones with the more pervious material placed on the outside.

The filter material on the downstream side between the impervious material and random fill is connected with a three foot thick horizontal layer of material to the toe drain. The material is shown on Plate XI. Appendix D as "Type A filter material" . A 24 inch reinforced concrete pipe with open joints and a length of about 170 feet is placed in the old creek bed to collect seepage. The pipe is placed in filter material and rock spalls.

Concrete gutters have been installed where the embankment meets the abutments on the downstream side of the embankment. The downstream slope is seeded and the top of dam has an 8 inch layer of select material. The profile of the dam has been cambered a maximum of one foot. A small embankment dike was constructed to close off a low saddle(Appendix D, Plate VII). The maximum height from original ground to top of this dike is about six feet. The length of dike is 450 feet, top width is 15 feet and side slopes are 3H to 1V. A cutoff trench to top of rock and a 3 line grout curtain is shown on the drawings. All material used in this dike consists of impervious fill.

2. Appurtenant Structures

The control structure is located upstream of the dam crest and is founded on, and anchored to rock. All walls are of reinforced concrete and access ladders and platforms provides access to different levels. The sluice gate and valve floor stands are enclosed in a reinforced concrete building with a cast-in-place concrete roof. The 54 inch I.D. concrete pipe was cast-in-place in a trench excavated in the rock. Anti-seepage collars are installed at 25 feet centers and are two feet high. Contraction joints in the pipe have rubber waterstops. The middle intake and high intake (Elevation 1310.25 and 1342.25) are 18 inch diameter cast-iron pipes placed in the fill. They have small headwalls and bar screens at the upstream end. The downstream end of the conduit has reinforced concrete headwall wingwalls and an apron, but no energy dissipators.

The spillway weir is broad crested and consists of a ten foot wide by 4 foot deep concrete section set in rock. The weir has a 3-line grout curtain and is 130 feet long. The approach channel and spillway chute are excavated in rock and have exposed rock surfaces except the weir and a 330 foot long section of retaining wall at the left side of the spillway. The chute changes in width from 130 feet to 65 feet in a distance of 210 feet. The slope of the chute is 19% over the first 310 feet and then changes to a 55% slope to the stilling basin. The stilling basin is excavated in rock. The lower part of the retaining wall is anchored into the rock with #11 dowels, the upper part is a gravity section with impervious fill material behind the wall.

2.2 CONSTRUCTION

The general appearance of the dam indicates that construction was performed in accordance with the design drawings. Construction data available for review included the original contract drawings and progress reports from the consultant. The consultant had a Registered Professional Engineer in charge of full time inspection. Progress reports indicate that the grout-take in the valley bottom was very small and staging was not used due to the small take. The type of rock in the spillway chute resulted in a rather rough appearance of the spillway.

2.3 OPERATION

The purpose of the dam is to supply domestic drinking water. Records of water elevations are by readings of an electrical contact gage. Maximum recorded water elevation was about 17 inches above spillway weir in 1975.

2.4 EVALUATION

a. Availability

A complete set of design drawings is now available in the files of PennDER . The first 20 sheets of a total of 39 sheets were obtained from the Consulting Engineer. Design criteria and design analysis are not in the files of PennDER, but some of these would be available in the files of the Consultant.

b. Adequacy

1. Hydrology and Hydraulics

Design criteria and analysis were not in the files. The permit application report stated that the "c" curve design Q for this drainage area was 6,825 c.f.s. and that the spillway capacity was sufficient to leave a freeboard of over 4 feet with this discharge.

2. Embankment

The embankment design as indicated on the design drawings is considered to be excellent. The necessary filters, drains and material transitions are indicated.

3. Appurtenant Structures

Design criteria and analyses were not available in the files of PennDER. The design drawings show all pertinent construction details. Sufficient information is available on the drawings to review and evaluate the structural adequacy.

c. Operating Records

No formal records are available except the gage readings. The manager for the waterworks stated that no major problems have occurred since construction was completed. The tropical storms Agnes (1972) and Eloise (1975) were not very severe in this area. The records indicate only a water depth of about 17 inches above spillway crest.

A ford across the downstream channel was damaged during a rainstorm and the main problem has been motorcycles making tracks on the downstream embankment slope.

d. Post Construction Changes

There have been no reported modifications to the original dam design, except that grouting was not staged due to the small take.

e. Seismic Stability

The dam is located in Seismic Zone 1 and it is considered that the static stability with normal safety factors is sufficient to withstand minor earthquake induced dynamic forces. No calculations or studies have been made to confirm this.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The general appearance of the dam is good. The appearance of the facilities indicate that the dam was constructed by a good contractor under good supervision and that all appurtenant structures are well maintained. The visual checklist is in Appendix A.

b. Dam

The dam embankments are in good condition. A large area of the downstream slope has been seeded with vetch. The berm at elevation 1300.0 has some wet areas caused by poor drainage. The concrete gutter at the right embankment needs some cleaning, especially the gutter on the berm. This will reduce the amount of water running onto the berm. Bike riders caused some scars on the embankment slope. These areas and a few erosion spots on the slope need repair and reseeding.

The two foot drain located in the former creek bed is discharging a small amount of water, but employees of the water company stated that there is no appreciable change in volume. Pine growth on the slopes, although minor at the present, should be controlled. Some boulders located at the conduit outlet should be removed (Appendix D, Plate V).

c. Appurtenant Structures

The control tower is in excellent condition. The sluice gates and valves are greased and operated every three months. The spillway crest and concrete retaining walls appear to be in good condition. Some erosion of the exposed rock in the spillway has occurred close to the footing of the retaining wall. This area should be reexamined when water is not overtopping the spillway, to ascertain if the walls are or will be undermined (Appendix D, Plate VI).

The unlined stilling basin appears to be of sufficient depth. Procedures should be established to insure that this area will be cleaned occasionally.

d. Reservoir Area

The area is clean and well maintained. The banks do not indicate any special erosion problems.

e. Downstream Channel

The downstream channel appears to be clean and clear of obstructions. The ford built across it has been damaged and is not usable.

The Birch Run Reservoir Dam is located about two miles downstream of this dam, with a much smaller spillway capacity. The area between the two dams is unoccupied woodland. Failure of Long Pine Run Dam would cause failure of Birch Run Reservoir Dam.

The area downstream of Birch Run Reservoir contains a State Park and many dwellings are located close to the stream, along Route 30. In case of failure of either dam loss of life could be considerable and extensive property damage would occur. Therefore, a hazard classification of "high" seems to be appropriate.

3.2 EVALUATION

The observed condition of the facility was good to excellent. The major point of concern is the erosion occurring close to the retaining wall in the spillway. Some eroded areas on the embankment need repair and reseeding.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

This impoundment dam was constructed to supplement the storage capacity of Birch Run Reservoir for the Chambersburg Water Company. The intent is to release water through the control tower if demands require. Normal flow over the weir has been, up to the present, sufficient and gates have only been operated for maintenance purposes.

4.2 MAINTENANCE OF DAM

No specific maintenance program has been established. The area is being policed and access has been limited to prevent damage to the slope by motorbike riders. Bike tracks are considerably less visible than some years ago. Maintenance has been limited to some reseeding.

4.3 MAINTENANCE OF OPERATING FACILITIES

The stems and operating floorstands are greased every three months according to the Manager, Mr. John Shadle. The gates and valves are opened at the same time interval to insure operable condition.

4.4 WARNING SYSTEM

There is no formal warning system in effect and the dam is not watched around the clock during heavy precipitation. The electric tape gage is read regularly but no check of the weir is made. There are no staff gauges on any of the structures. The access road to the dam has bridges over the Birch Run and Long Pine Run at a grade elevation of 1372.0.

4.5 EVALUATION

The general operational procedures are satisfactory, except that no formal warning system is in effect. There is no permanent staff of the Borough living close to the dam.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

a. Design Data

The hydrologic and hydraulic analysis available from PennDER for Long Pine Run Dam was not very extensive. No frequency curve, unit hydrograph, design storm, or flow routing were contained in the file, but those items were subsequently obtained from the design engineer. There was a statement in the permit application that, "the spillway can discharge a flow of 6,825 c.f.s. with a freeboard in excess of four feet. This figure is from the PennDER "c" curve.

An area-capacity curve and a rating curve for the outlet works were also available.

b. Experience Data

Long Pine Run Dam was completed in 1970 and in the period since then there have been two exceptional storms. The records of the water company manager indicate the following:

Date	Maximum observed head on spillway (Inches)
June 23, 1972	16
September 26, 1975	17

The dam passed these storms without difficulty.

c. Visual Observations

On the date of the inspection, no conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event, until the dam is overtopped.

d. Overtopping Potential

Long Pine Run Dam has a total storage capacity of 7,490 acre feet and the total height is 112 feet. These dimensions indicate a size classification of "Large". It should be noted that this dam is just barely over the line into the "Large" category.

The hazard classification for this dam is "high" (Section 3.1.e).

The recommended Spillway Design Flood (SDF) for a dam having a "High" hazard potential classification and a "Large" size classification is a PMF (Probable Maximum Flood). For this dam the design engineer has calculated a PMF of 14,700 cfs and the total spillway capacity is 16,700 cfs (see Appendix B).

e. Spillway Adequacy

Since the design engineer's calculated PMF figure of 14,700 cfs inflow and 13,700 cfs outflow is less than the total spillway capacity of 16,700 cfs, it is assumed that the spillway is adequate to pass the designer's PMF.

The spillway capacity of Long Pine Birch Run Dam is approximately 16,700 cfs and the spillway capacity of Birch Run Reservoir Dam, about 1.9 miles downstream, is about 9,300 cfs. It, therefore, appears that Birch Run Reservoir Dam will have failed before Long Pine Run Dam is overtopped.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation

1. Embankment

There were no visual observations of undue embankment stresses or sloughage. Motorbike tracks and some erosion has scarred the downstream slope, but have not caused any serious problems. The seepage out of the 24" toe drain does not appear to be excessive.

2. Appurtenant Structures

Visual observations indicate no present stability or stress problems in any of the appurtenant structures. The only exception is the possible undermining of the retaining wall in the chute.

b. Design and Construction Data

1. Embankment

Design criteria for embankment stability was not available in the files. The indicated zoning and slopes of the embankment appear to be adequate for this type of construction. The grouting take was limited and this indicates a good foundation. The borings indicate a good subsurface and the dam appears to be well engineered. No seepage problems have occurred. The cross slope and longitudinal profile of the berm prevents good drainage and water was standing on the berm.

2. Appurtenant Structures

A review of the design drawings indicate a well engineered conduit and control tower. Reinforcing appears adequate and a review of the foundation of the tower indicates a design against uplift.

The spillway weir is anchored to rock and has a grout curtain. The retaining walls in the spillway appear adequate if further erosion can be prevented. The spillway has not been exposed to a large discharge and erosion could occur at many places due to the fractured rock.

c. Operating Records

While no formal operating records were available, Mr. John Shadle, manager for the Borough, stated that no major problems have occurred since the dam became operational in 1970.

d. Post Construction Changes

There have been no reported modifications to the original dam design.

e. Seismic Stability

This dam is located in Seismic Zone No.1 and it is considered that the static stability is sufficient to withstand minor earthquake induced dynamic forces. However, no calculations, studies, etc., were made to confirm this conclusion.

SECTION 7 - ASSESSMENT & REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

The visual inspection, review of design drawings and the operational history indicate that the dam is in good condition and designed and constructed in accordance with acceptable engineering practice. A few minor maintenance items should be attended to in order to prevent possible future damage of the embankment slope.

The main concern is the spillway capacity and the possible damage which could occur downstream at the next reservoir (Birch Run Reservoir). Due to its location upstream from another dam and the presence of a State Park and many cabins downstream, this dam is considered to be a high hazard dam with a large size classification. The recommended Spillway Design Flood (SDF) is the PMF. The design engineer's calculations indicate that the spillway can pass 114% of the PMF (See Appendix B).

b. Adequacy of Information

The available information is considered to be adequate to make a detailed assessment of the project.

c. Urgency

It is considered that the recommended suggestions in this section should be implemented as soon as practical.

d. Necessity for Additional Studies

Additional studies are not required at this time. However, attention should be given to the recommendations presented below.

7.2 RECOMMENDATIONS

a. Facilities

1. Owner should employ an experienced engineer to investigate the erosion in the spillway chute and contract for necessary repairs if deemed necessary to prevent undermining of the retaining wall.

2. Owner should maintain embankment slopes by repairing eroded areas and seed ground cover.

3. Owner should clean the concrete gutter at the right abutment and improve drainage in the gutter to the lower slope.

4. Owner should install an outside staff gage.

5. The flow from the 24 inch pipe should be measured and recorded on a regular schedule to determine if the flow increases or is cloudy, or if there is evidence of movement of fines in the water. Appropriate action shall be taken if these things occur.

b. Operation and Maintenance Procedures

Although the dam is maintained in good condition, it is considered important that the following procedures be adopted.

1. A formal surveillance and warning procedure should be developed to be used during period of high precipitation and a downstream warning system should be implemented.

2. Clean out outlet channel of conduit.

APPENDIX A

VISUAL CHECKLIST

CHECK LIST - DAM INSPECTION PROGRAM

PHASE I - VISUAL INSPECTION REPORT

NAD NO. 328

PA. ID # I-82 NAME OF DAM Long Pine Run HAZARD CATEGORY High

TYPE OF DAM: Zoned Earthfill

LOCATION: Franklin TOWNSHIP Adams COUNTY, PENNSYLVANIA

INSPECTION DATE 4-20-78 WEATHER Cloudy - Cool TEMPERATURE 40's

INSPECTORS: R. Houseal - H. Jongsma
R. Steacy - A. Bartlett
Borough
John Shadle

NORMAL POOL ELEVATION: 1360 AT TIME OF INSPECTION:

BREAST ELEVATION: 1372 POOL ELEVATION: 1372.2

SPILLWAY ELEVATION: 1360 TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: 1361.4

GENERAL COMMENTS:

Dam appearance is good - Surrounded by forest terrain.
Large Facility.
Some erosion on lower slopes.

DAM NO. NAD 328

VISUAL INSPECTION

EMBANKMENT	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. SURFACE CRACKS	None evident Good stone roadway on top	
B. UNUSUAL MOVEMENT BEYOND TOE	None evident	
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	Upstream - none downstream-some erosion due to sandy nature of surface soil. No sloughing or slope surface deformities	
D. VERTICAL & HORIZONTAL ALIGNMENT OF CREST	No distress stoned roadway on breast	
E. RIPRAP FAILURES	No evidence	
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Appears sound - no distress Some rutting due to roadway extension up over slopes to top of dam	Concrete gutter on right abutment should be cleaned
G. SEEPAGE	Standing free water on terrace. Appears to be poor grading of berm. Holding surface water.	
H. DRAINS	24" pipe at toe of lower slope - steady flow	
J. GAGES & RECORDER	Electrical contact gage inside control house	
K. COVER(GROWTH)	Downstream weed growth-some small pine trees at random locations U.S.Rock - fine & coarse	

C.	SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	(Cont'd) Eroded ditch on lower slopes from terrace or berm. Should be repaired with possible regrading of entire terrace. Other erosion and rutting on lower slope at random mostly on left side upstream.

DAM NO. NAD 328

VISUAL INSPECTION

OUTLET WORKS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. INTAKE STRUCTURE	Housed tower	
B. OUTLET STRUCTURE	Head wall with wings. Large boulders in basin, no flow of water	Should be cleaned.
C. OUTLET CHANNEL	Fair condition. Small rocks - some grass leads to stream below spillway.	
D. GATES	Good condition. Well greased. 3 Gates & Control Valve	
E. EMERGENCY GATE	24 x 36 Inch Gate	
F. OPERATION & CONTROL	Excellent	
G. BRIDGE (ACCESS)	None - Access directly from top of dam into housing.	

DAM NO. NAD 328

VISUAL INSPECTION

SPILLWAY	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. APPROACH CHANNEL	Excavated through natural rock formation	
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Concrete weir on rock Smooth - clear None evident Nil Into rock - good	
C. DISCHARGE CHANNEL Lining Cracks Spilling Basin	Excavated in natural rock formation-rocks dislodge and fall Natural excavated pond at bottom of spillway	
D. BRIDGE & PIERS	None	
E. GATES & OPERATION EQUIPMENT	None	
F. CONTROL & HISTORY		
	Undercut left side looking downstream, possibly under wall	To be investigated Access difficult

DAM NO. NAD 328

VISUAL INSPECTION

MISCELLANEOUS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
INSTRUMENTATION		
Monumentation		
Observation Wells	No	
Weirs	No	
Piezometers	No	
Other	No	
RESERVOIR		
Slopes	Forest	
Sedimentation		
DOWNSTREAM CHANNEL		
Condition	Natural Stream Rocks and Boulders	
Slopes	Forest	
Approximate Population		
No. Homes	State Park, Intake Plant and many Cabins	High Hazard

APPENDIX B

HYDROLOGY/HYDRAULICS

PROJECT Dam Investigation SHEET NO. 1 OF

SUBJECT Long Pine Run Dam: I.D. No. 328

COMPUTED BY RCS DATE 4-26-78 CHECKED BY JJPJ 5-1-78

Maximum known flood at damsite

Water company manager records indicate maximum known flood since construction of dam occurred on Sept. 26, 1975. He reports head on weir was 17 inches.

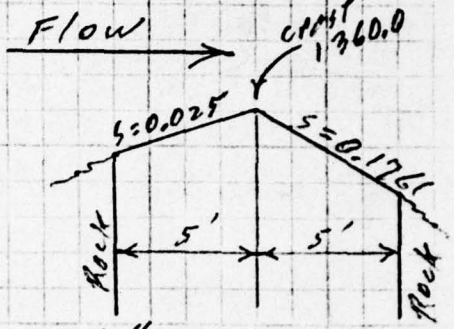
$L = 130$, $H = \frac{17}{12} = 1.42$

$C = 3.09$

$Q = C L H^{3/2}$

$= 3.09 \times 130 \times (1.42)^{3/2}$

$= 680$ cfs



"C" = 3.09 Ref. M. Hanowitz, C. of E. Balt. Dist.

Warm water outlet is 18-inch pipe, invert elevation 1342.25 ft., length 55 ft. Assume pool at 1360 ft.

Pipe $V = \frac{0.590}{n} \times d^{2/3} \times s^{1/2}$

$V = \frac{0.590}{0.014} \times 1.5^{2/3} \times 0.309^{1/2}$

$= 42.1 \times 1.31 \times 0.556$

$= 30.7$ ft/sec

$n = 0.014$
$d = 1.5$
$s = \frac{1360 - 1343}{55}$
$= 0.309$

$Q = VA = 30.7 \times \pi R^2$

$= 30.7 \times 1.77$

$= 54$ use 50 cfs

Ungated spillway capacity at maximum pool elevation 1372.0 (top of dam)

$L = 130$, $H = 1372 - 1360 = 12$ ft, $C = 3.09$

$Q = C L H^{3/2} = 3.09 \times 130 \times (12)^{3/2}$

$= 16{,}698$ use 16,700 cfs

PROJECT Dam Investigation SHEET NO. 6 OF

SUBJECT Long Pine Run Dam I.D. No. 328

COMPUTED BY REE DATE 4-26-78 CHECKED BY JJPJr

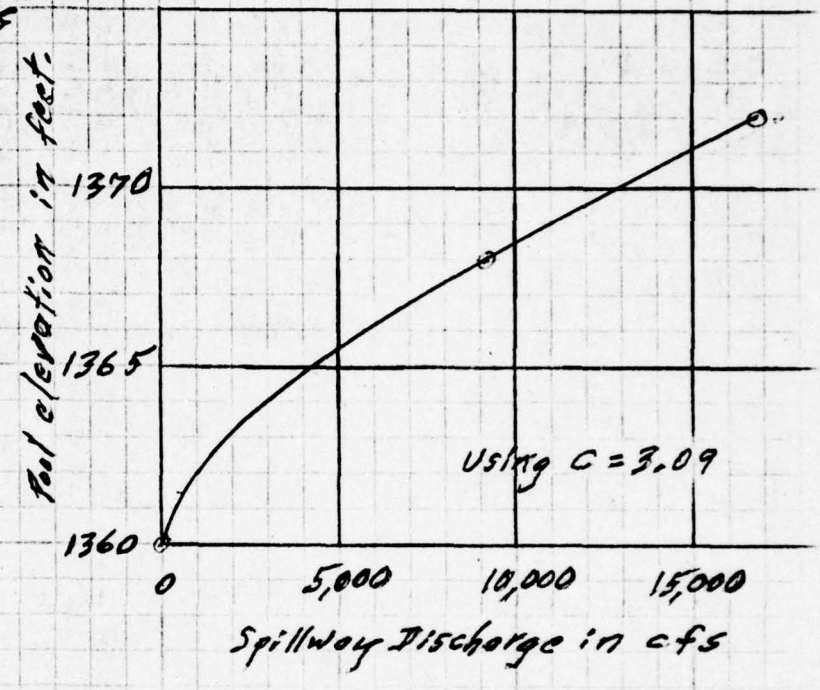
5-1-78

For freeboard of 4 ft

$C = 3.09$, $L = 130$, $H = 8$ ft c/cr. = 1368

$Q = CLH^{3/2} = 3.09 \times 130 \times (8)^{3/2}$

$= 9{,}090$ cfs



Size Classification

Maximum storage = 7,490 acre feet.

Maximum Height = 107 feet.

Size Classification is "Large".

Hazard Classification

Failure of Long Pine Run Dam could cause failure of Birch Run Reservoir Dam, 2.0 miles downstream. Loss of some houses and lives could also result. Use "High"

Recommended Spillway Design Flood.

The above classifications indicate use of an SDF equal to the Probable Maximum Flood.

PMF = 22,700 cfs with time = 57 hours.

From Corps of Eng. relation curve

= 14,700 cfs from Snyder type computation by designer.

SUBJECT Craig Fine Run Dam Lot # 260

COMPUTED BY RES DATE 6-7-78 CHECKED BY

The designer routed the 14,700 cfs PMF through the reservoir and obtained a peak outflow of 13,700 cfs.

$$\frac{\text{Total spillway capacity}}{\text{PMF Outflow}} = \frac{16,700}{14,700} = 114\%$$

The spillway should pass a flow equal to the designer's PMF value with about 1.0 foot of freeboard.

APPENDIX C

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam

Formation Name: Weaverton Quartzite.

Lithology: The Weaverton is a thick (1,500 to 1,600 feet) unit of impure quartzites varying in texture and composition. Generally speaking it is a medium to coarse grained micaceous sandstone with quartz cement. Some conglomerate beds are present. Some of the more impure beds have phyllitic texture.

Bedrock - Reservoir

Formation Names: Weaverton Quartzite, Lower Montalto and Upper Montalto Members of the Harpers Formation, Antietam Quartzite and Tomstown Formation.

Lithologies: Weaverton Quartzite (see above). Lower Montalto Member consists of white to grayish medium grained, impure quartzite, generally thin bedded, which weathers to grayish-orange color. The Upper Montalto Member is a gray to white, medium to coarse grained quartzite, composed of quartz grains and a few feldspar grains cemented with quartz. The Antietam Quartzite is light gray, medium grained, impure quartzite that weathers gray to grayish orange. The uppermost part is schistose, and grades into the overlying Tomstown Formation which is a dark, bluish gray dolomite with shaly laminae.

Structure

The rocks of the area have been subjected to at least one episode of compression, resulting in tight folding, faults paralleling the fold directions, cross faults and much fracturing and shearing of the brittle quartzitic rocks. The more phyllitic beds develop flow cleavage. The Long Pine Dam is located on the northwest limb of an overturned anticline. The beds strike N40°E and dip 68°SE. The beds overturned. Cleavage has the same strike as bedding and dips 45°SE.

A cross fault is mapped, roughly parallel to the valley of Long Pine Creek below the dam, and may continue to beneath the dam. The contact of the Weaverton Quartzite with the Lower Montalto Member just upstream from the dam is not offset, however. Some of the schistose zones noted in the core descriptions may be related to the dying out phase of this fault. Schistose zones and slickensides on fractures and bedding planes are common in all of the core

descriptions. These are the natural consequence of tight folding of brittle rocks. Thre is no evidence of major faulting or shear zones which might be the loci of increased groundwater movement.

Overburden

The Weaverton Quartzite weathers to a thin, sandy soil, full of boulders and outcrops are common. Core logs indicate maximum thickness of overburden of 14 to 17 feet on the hilltops with less on the hillsides. The valley of Long Pine Creek was filled with up to 40 feet of coarse alluvium. The bedrock beneath the alluvium is generally fresh and sound.

Aquifer Characteristics

The Weaverton Quartzite is composed of essentially impermeable rock. Groundwater movement is along bedding planes, cleavage planes and fractures. The rock is essentially insoluble and there is only minor alteration, such as iron staining, to indicate groundwater action. Because it is so thin there is little or no groundwater storage in the weathered overburden.

The rocks in the reservoir area have similar water bearing characteristics, except for the Tomstown Formation. The latter is a carbonate and susceptible to solution. The area of the reservoir underlain by the Tomstown is small, and far from the dam.

Discussion

The Long Pine Dam rests on a very strong rock, not susceptible to deep weathering. Water movement in this rock is through fairly tight fractures and bedding planes. It is unlikely that continued movement could cause more than minor leakage, or that the rock would break down in any way as the result of this leakage.

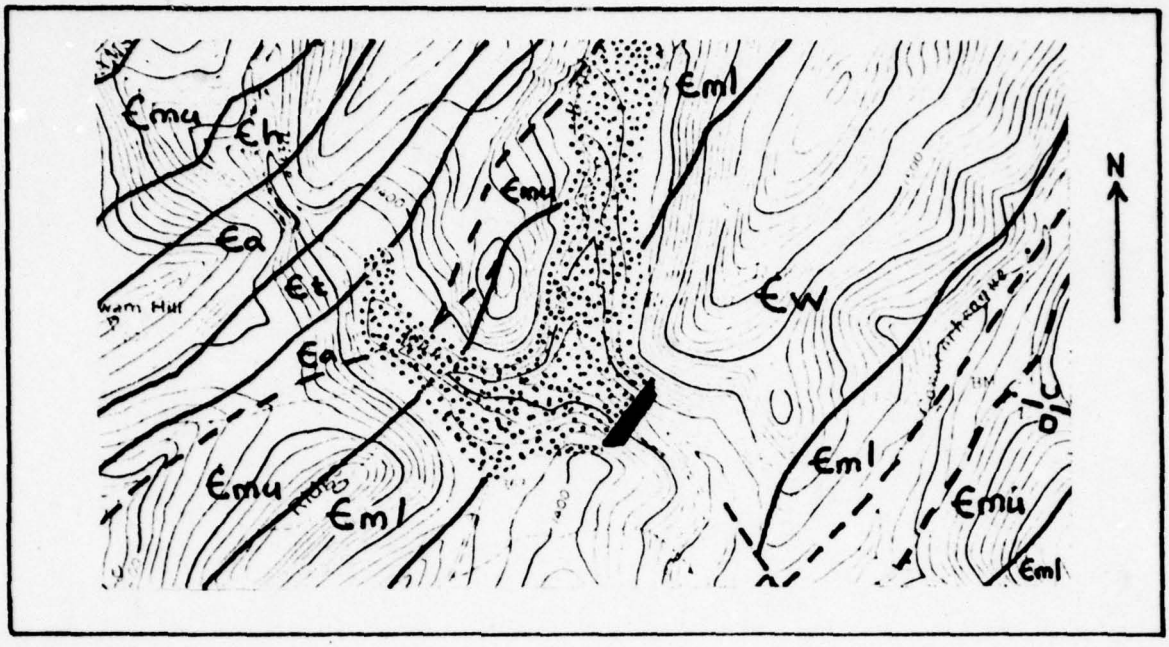
Sources of Information

(1) Fauth, John L. (1968) "Geology of the Caledonia Park Quadrangle Area, South Mountain, Pa." Pa. Geological Survey, 4th Series, Atlas 129a.

(2) Air Photos, Scale 1:24,000, dated 1968.

(3) Logs of core borings.

Figure 1.



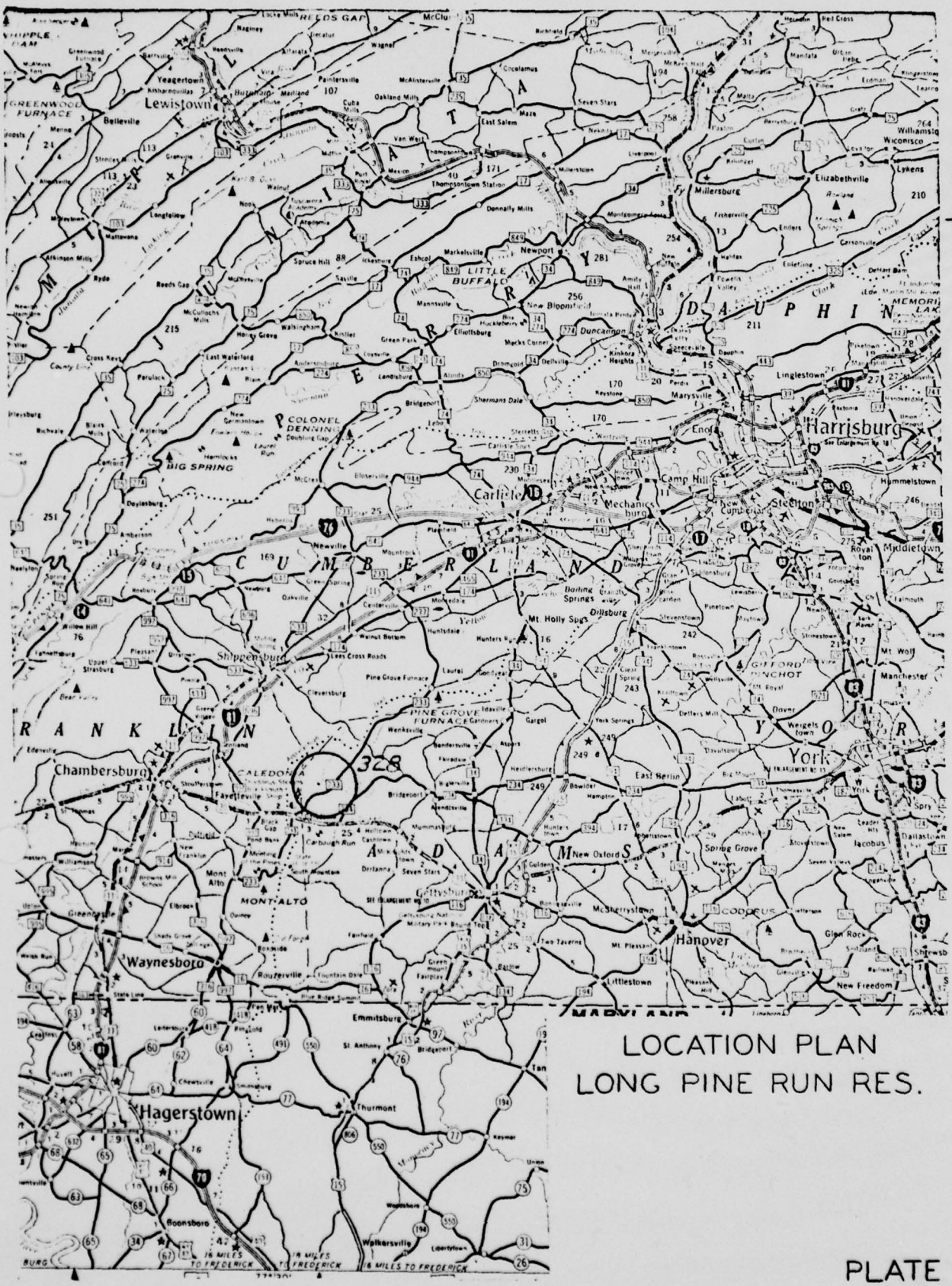
GEOLOGIC MAP - LONG PINE RUN RESERVOIR

Et — Tomstown Dolomite	Ew — Weaverton Quartzite
Ea — Antietam Quartzite	Strike & Dip of Bedding
Eh — Upper Harpers	Lithologic Contact
Emu — Upper Montalto Member	U/D Fault Contact
Eml — Lower Montalto Member	

(Geology from PAGS Bulletin 129a)

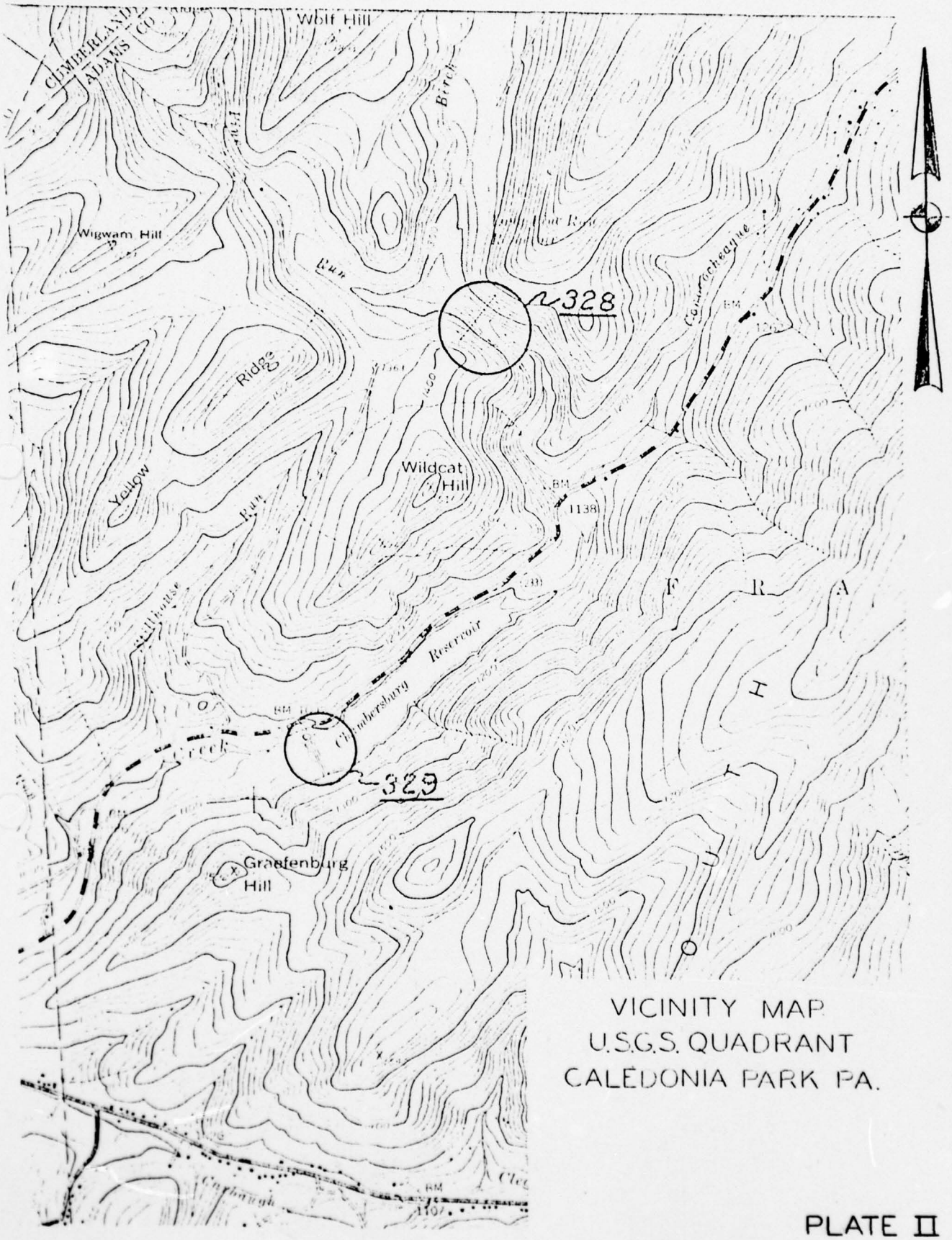
APPENDIX D

LOCATION, PHOTOGRAPHS & DESIGN DRAWINGS



LOCATION PLAN
LONG PINE RUN RES.

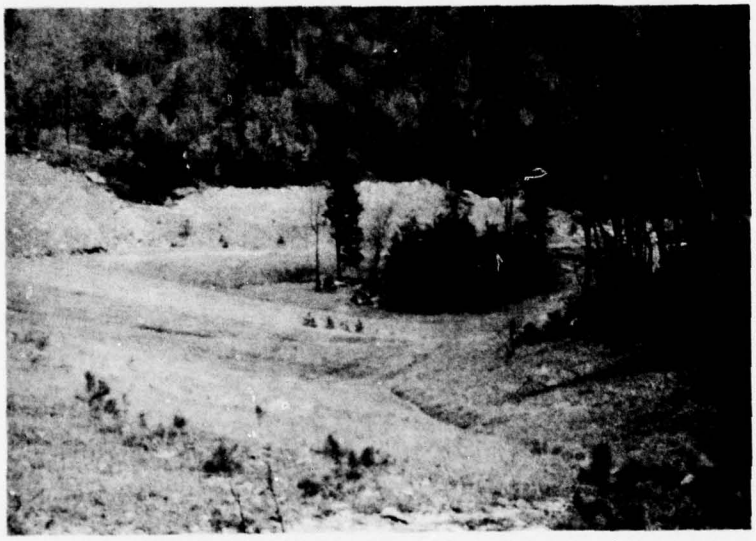
PLATE I



VICINITY MAP
U.S.G.S. QUADRANT
CALEDONIA PARK PA.

PLATE II

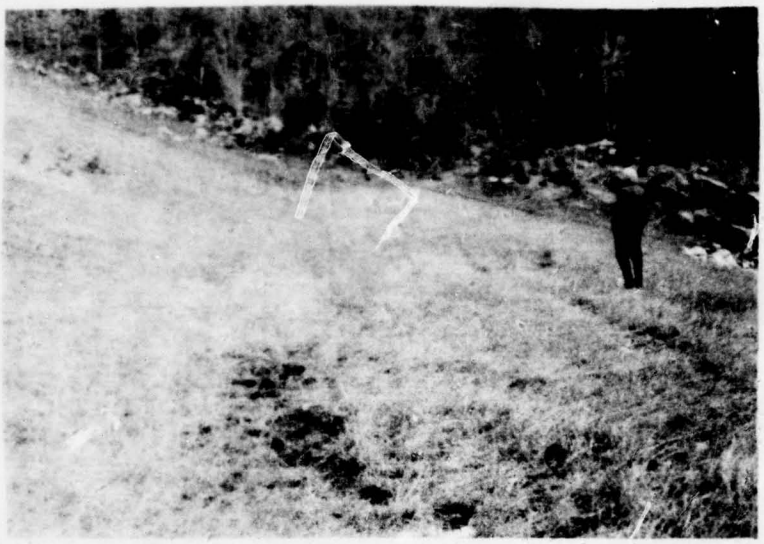
General View of
Downstream
Embankment



Right
Embankment
Abutment

Top of Dam

PLATE III



Berm With
Wet Area

Right Concrete
Gutter

Downstream
Channel

PLATE IV

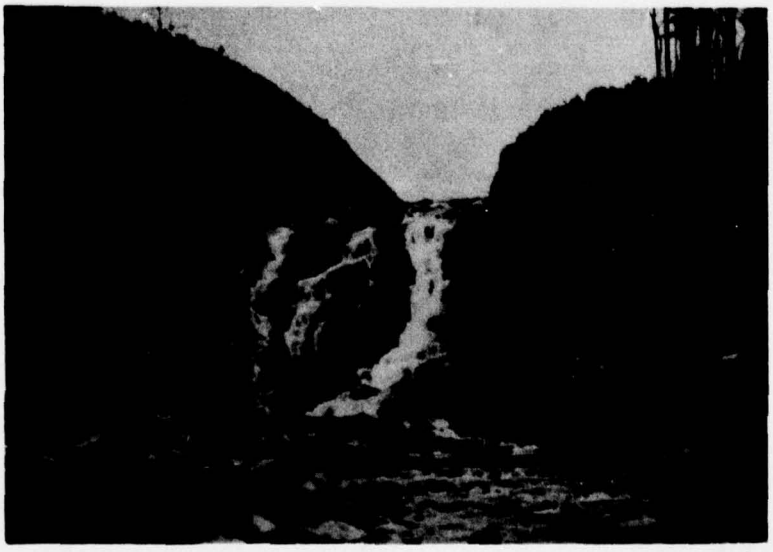
54" Conduit Outlet

24" Drain Pipe

PLATE V

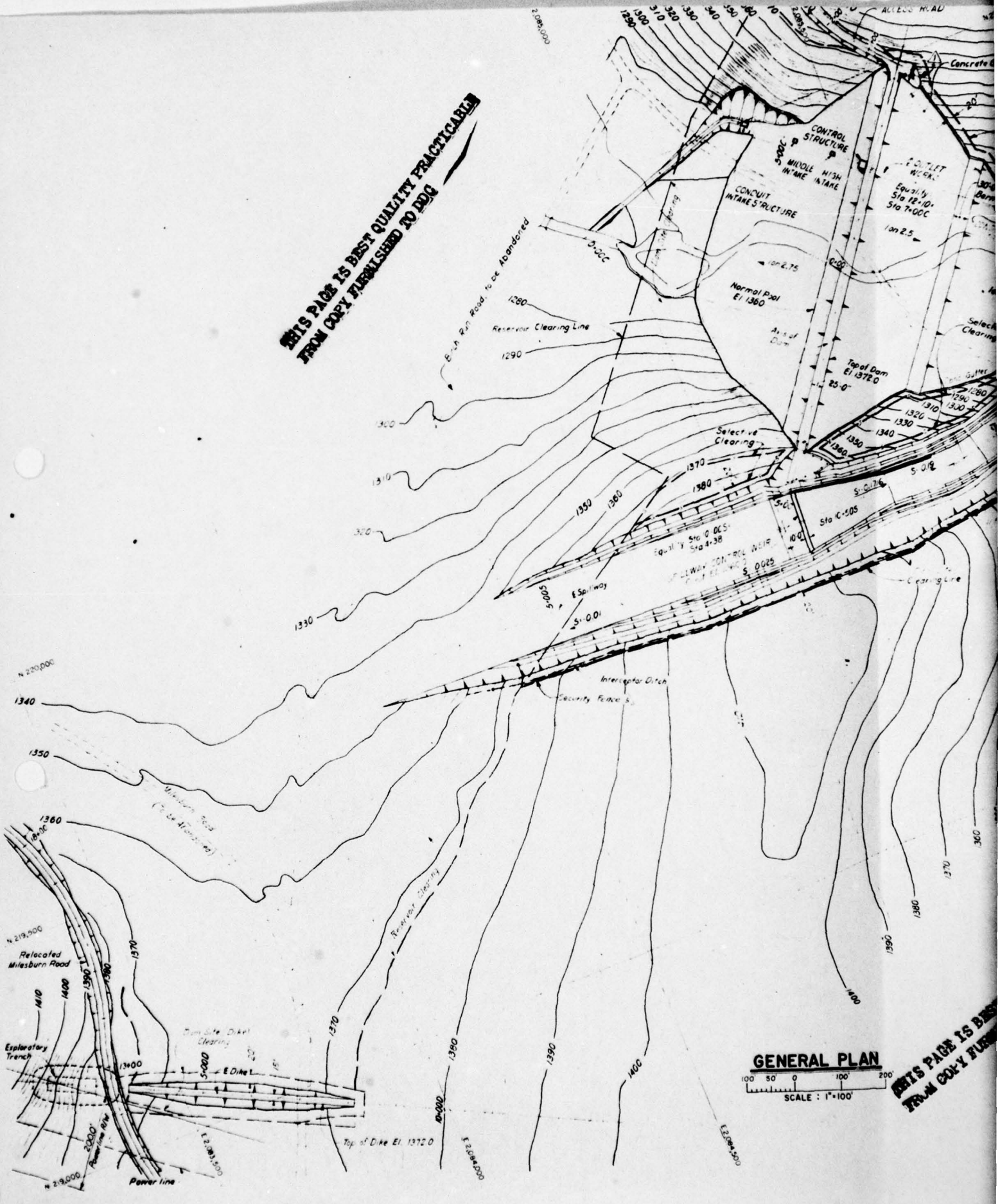
Broadcrested
Weir

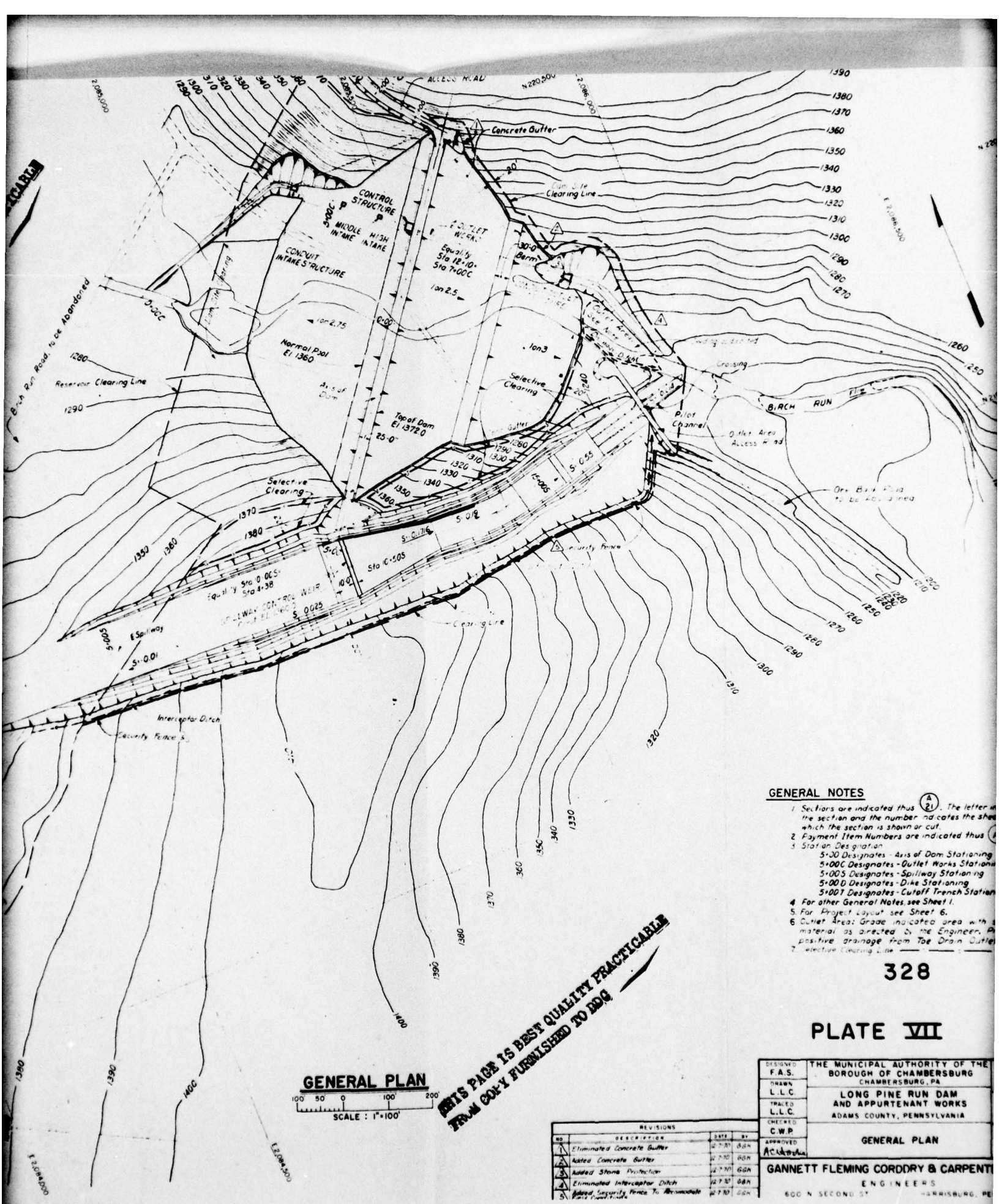
Erosion Spillway
Chute



Spillway and
Stilling Basin

PLATE VI





GENERAL NOTES

1. Sections are indicated thus (A/21). The letter indicates the section and the number indicates the sheet on which the section is shown or cut.
2. Payment Item Numbers are indicated thus (1).
3. Station Designation
   - 5+30 Designates - Axis of Dam Stationing
   - 5+00C Designates - Outlet Works Stationing
   - 5+00S Designates - Spillway Stationing
   - 5+00D Designates - Dike Stationing
   - 5+00T Designates - Cutoff Trench Station
4. For other General Notes, see Sheet 1.
5. For Project Layout see Sheet 6.
6. Outlet Area: Grade indicated area with suitable material as directed by the Engineer. Provide positive drainage from Toe Drain Outlet.
7. Selective Clearing Line ——— ——— ———

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GENERAL PLAN

100 50 0 100 200

SCALE : 1"=100'

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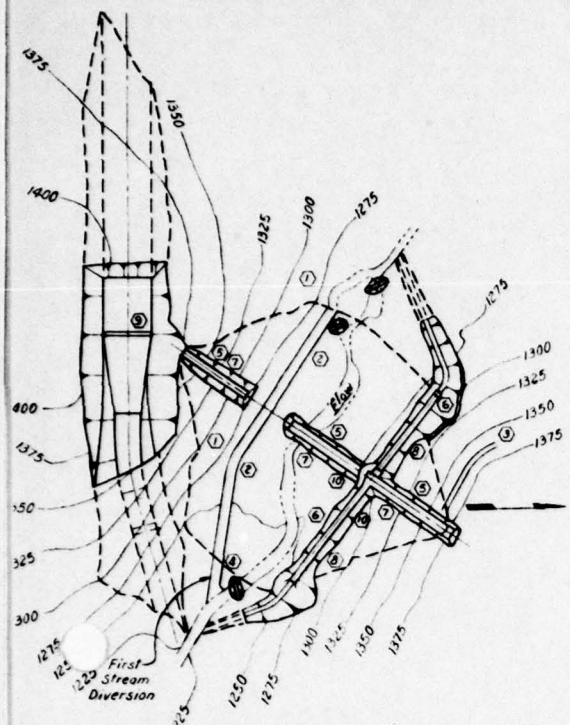
PLATE VII

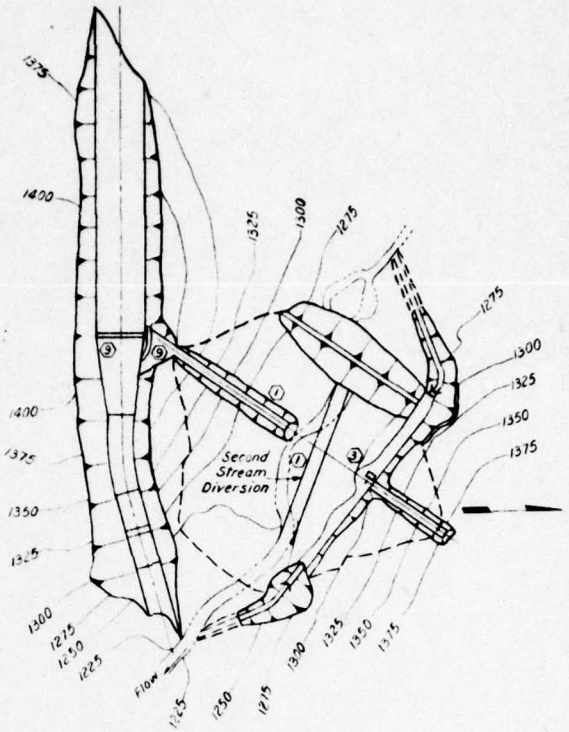
REVISIONS			
NO	DESCRIPTION	DATE	BY
1	Eliminated Concrete Gutter	12-7-70	GGH
2	Added Concrete Gutter	12-7-70	GGH
3	Added Stone Protection	12-7-70	GGH
4	Eliminated Interceptor Ditch	12-7-70	GGH
5	Added Security Fence To Accomodate Field Found Fence	12-7-70	GGH

DESIGNED F.A.S.	THE MUNICIPAL AUTHORITY OF THE BOROUGH OF CHAMBERSBURG CHAMBERSBURG, PA
DRAWN L.L.C.	LONG PINE RUN DAM AND APPURTENANT WORKS ADAMS COUNTY, PENNSYLVANIA
TRACED L.L.C.	
CHECKED C.W.P.	GENERAL PLAN
APPROVED A.C. Hoover	

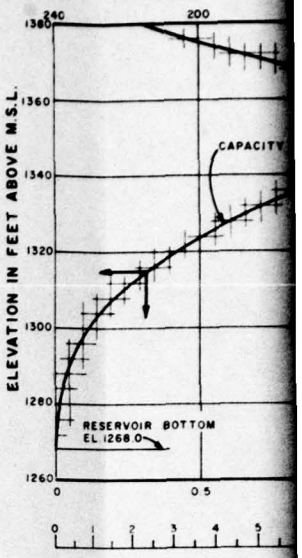
GANNETT FLEMING CORDDRY & CARPENTER
ENGINEERS
600 N SECOND ST HARRISBURG, PE

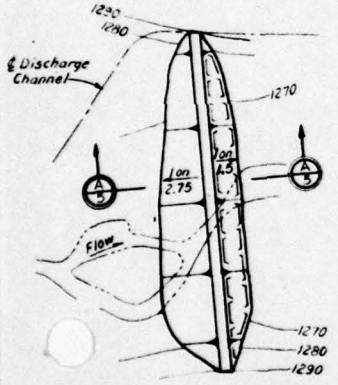


PHASE I
THROUGH OCTOBER, 1969



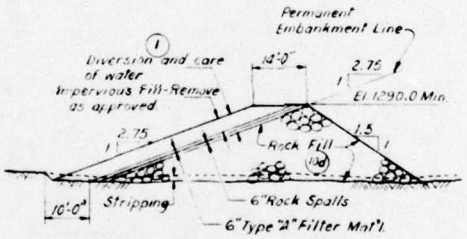
PHASE II
THROUGH MAY, 1970





PLAN- COFFERDAM

SCALE: 1"=100'



SECTION A5

SCALE: 1"=20'

SCHEMATIC CONSTRUCTION SEQUENCE

CONSTRUCTION SEQUENCE

Construction of the Dam and Appurtenant Works may be done in three phases as outlined below. The numbering system on each phase does not necessarily reflect the chronological order of works.

PHASE I

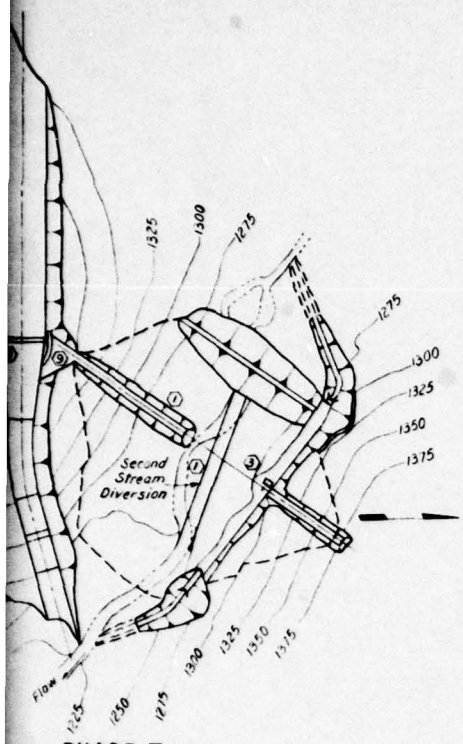
1. Clearing and grubbing damsite, clearing reservoir area.
2. Stripping rock and boulder beds from valley floor.
3. Begin road relocations including access road construction.
4. Complete first stream diversion.
5. Open cutoff trench up south abutment, the valley floor north of the relocated stream and up the north abutment.
6. Open and complete outlet works excavation.
7. Begin drilling and grouting programs on south abutment, stream floor and north abutment.
8. Begin and complete outlet works concrete construction to some mid-height of control structure.
9. Open spillway excavation downstream of Sta. 9+00S down to elevation 1360 feet. Place weir and grout cap and proceed with drilling and grouting of parking area and spillway. Observe limitations of blasting distance from grouting and concrete.
10. Backfill cutoff trench valley floor and the outlet works excavation.

PHASE II

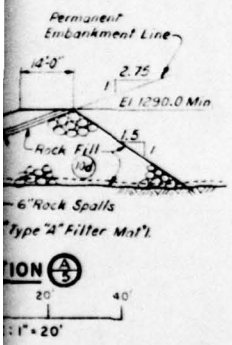
1. During the last of October, 1969, accomplish second stream diversion, open cutoff trench at toe of south abutment and place grout cap.
2. Open exploratory trench and begin exploration, drilling and grouting program.
3. Complete control structure.
4. Complete road relocations. Complete valley floor drilling and grouting.
5. Begin spillway wall concrete work and control weir.
6. Backfill valley floor cutoff trench, strip embankment area.

PHASE III

1. Construct permanent cofferdam, complete final diversion through
2. Excavate remaining spillway and excavate from borrow area to construct embankment. Construct dike.
3. Complete spillway concrete.
4. Paint, seed and clean-up.
5. Gate closure November, 1970.



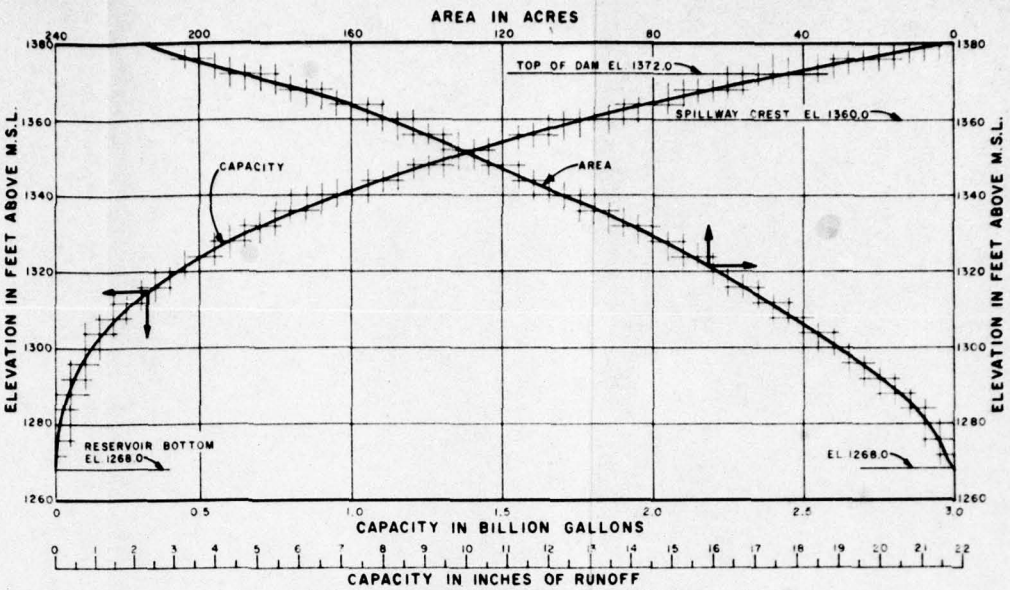
PHASE II
THROUGH MAY, 1970



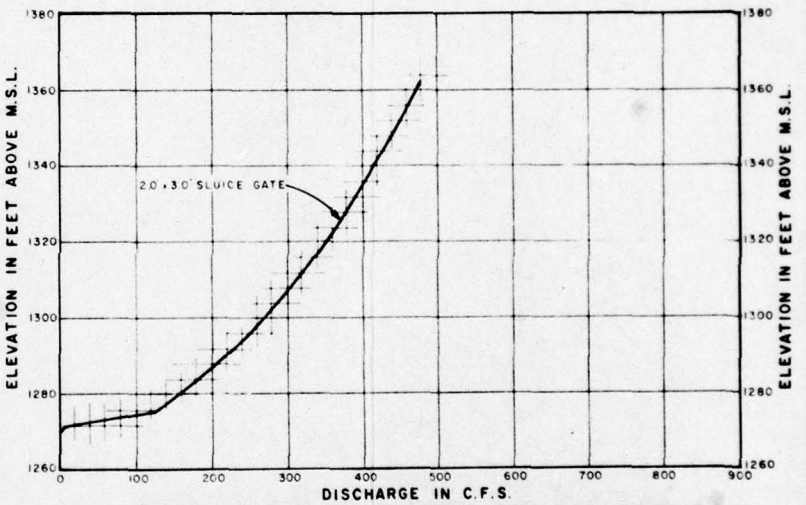
TION (A-5)

20' 40'

1" = 20'



AREA-CAPACITY CURVES



OUTLET WORKS DISCHARGE RATING CURVES

UENCE

...er, 1969, accomplish second stream diversion, ...e of south abutment and place grout cap. ...nd begin exploration, drilling and grouting ...ure.
...s. Complete valley floor drilling and grouting ...ete work and control weir. ...off trench, strip embankment area.

...erdam, complete final diversion through ...way and excavate from borrow area to ...onstruct dike. ...ete.
..., 1970.

GENERAL NOTES:

1. Hydraulic data is presented for information purposes only.
2. The Construction Sequence presented, with the exception of elevation specifically shown on this drawing, is a suggested method to accomplish the required work. The Contractor may submit this schedule to accomplish the work according to the suggested method or he shall submit a schedule based upon his own suggested method for approval in accordance with the specifications.
3. Drainage patterns and facilities necessary to insure proper drainage of backfill, fill or embankment surfaces without adverse affects upon completed works shall be subject to the approval of the Engineer.

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PLATE VIII

DESIGNED F.A.S.	THE MUNICIPAL AUTHORITY OF THE BOROUGH OF CHAMBERSBURG, CHAMBERSBURG, PA	SHEET NO. 5
DRAWN D.W.R.	LONG PINE RUN DAM AND APPURTENANT WORKS	JOB NO. 4562
TRACED T.H.W.	ADAMS COUNTY, PENNSYLVANIA	
CHECKED C.W.P.	CONSTRUCTION SEQUENCE AREA, CAPACITY AND DISCHARGE RATINGS	DATE SEPT. 1968
APPROVED		

REVISIONS			
NO	DESCRIPTION	DATE	BY

GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS
600 N. SECOND ST. HARRISBURG, PENNA.

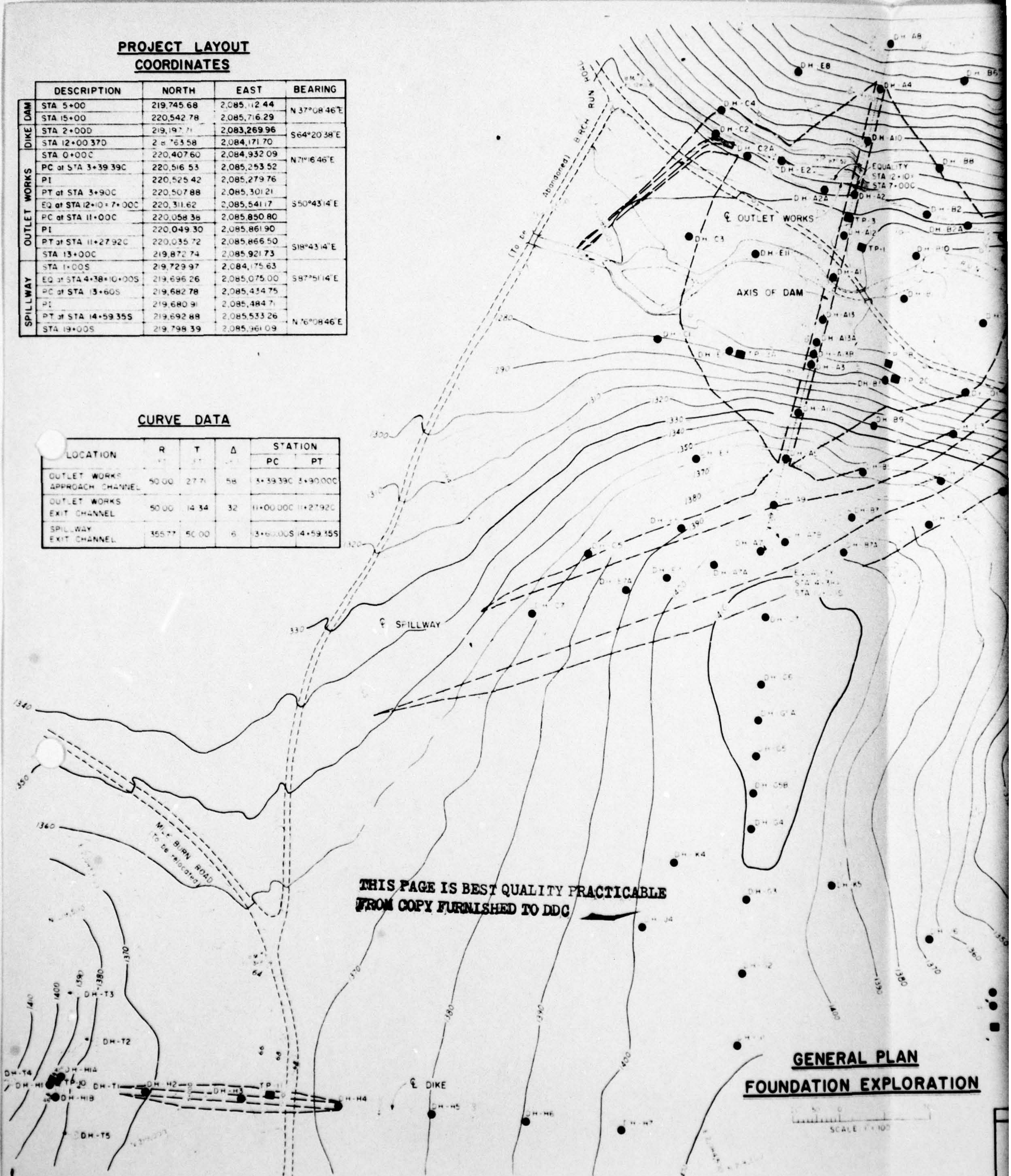
2

PROJECT LAYOUT COORDINATES

	DESCRIPTION	NORTH	EAST	BEARING
DAM	STA 5+00	219,745.68	2,085,112.44	N 37°08'46"E
DAM	STA 15+00	220,542.78	2,085,716.29	
DIKE	STA 2+00D	219,19[illegible]	2,083,269.96	S64°20'38"E
DIKE	STA 12+00.37D	2[illegible]763.58	2,084,171.70	
OUTLET WORKS	STA 0+00C	220,407.60	2,084,932.09	N71°16'46"E
OUTLET WORKS	PC at STA 3+39.39C	220,516.53	2,085,253.52	
OUTLET WORKS	PI	220,525.42	2,085,279.76	
OUTLET WORKS	PT at STA 3+90C	220,507.88	2,085,301.21	
OUTLET WORKS	EQ at STA 12+10 = 7+00C	220,311.62	2,085,541.17	S50°43'14"E
OUTLET WORKS	PC at STA 11+00C	220,058.36	2,085,850.80	
OUTLET WORKS	PI	220,049.30	2,085,861.90	
OUTLET WORKS	PT at STA 11+27.92C	220,035.72	2,085,866.50	S18°43'14"E
OUTLET WORKS	STA 13+00C	219,872.74	2,085,921.73	
SPILLWAY	STA 1+00S	219,729.97	2,084,175.63	
SPILLWAY	EQ at STA 4+38 = 10+00S	219,696.26	2,085,075.00	S87°51'14"E
SPILLWAY	PC at STA 13+60S	219,682.78	2,085,434.75	
SPILLWAY	PI	219,680.91	2,085,484.71	
SPILLWAY	PT at STA 14+59.35S	219,692.88	2,085,533.26	N 76°08'46"E
SPILLWAY	STA 19+00S	219,798.39	2,085,961.09	

CURVE DATA

LOCATION	R	T	Δ	STATION	
				PC	PT
OUTLET WORKS APPROACH CHANNEL	50.00	27.7[illegible]	58	3+39.39C	3+90.00C
OUTLET WORKS EXIT CHANNEL	50.00	14.34	32	11+00.00C	11+27.92C
SPILLWAY EXIT CHANNEL	355.77	50.00	6	13+6[illegible]00S	14+59.35S



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GENERAL PLAN
FOUNDATION EXPLORATION

SCALE 1" = 100'

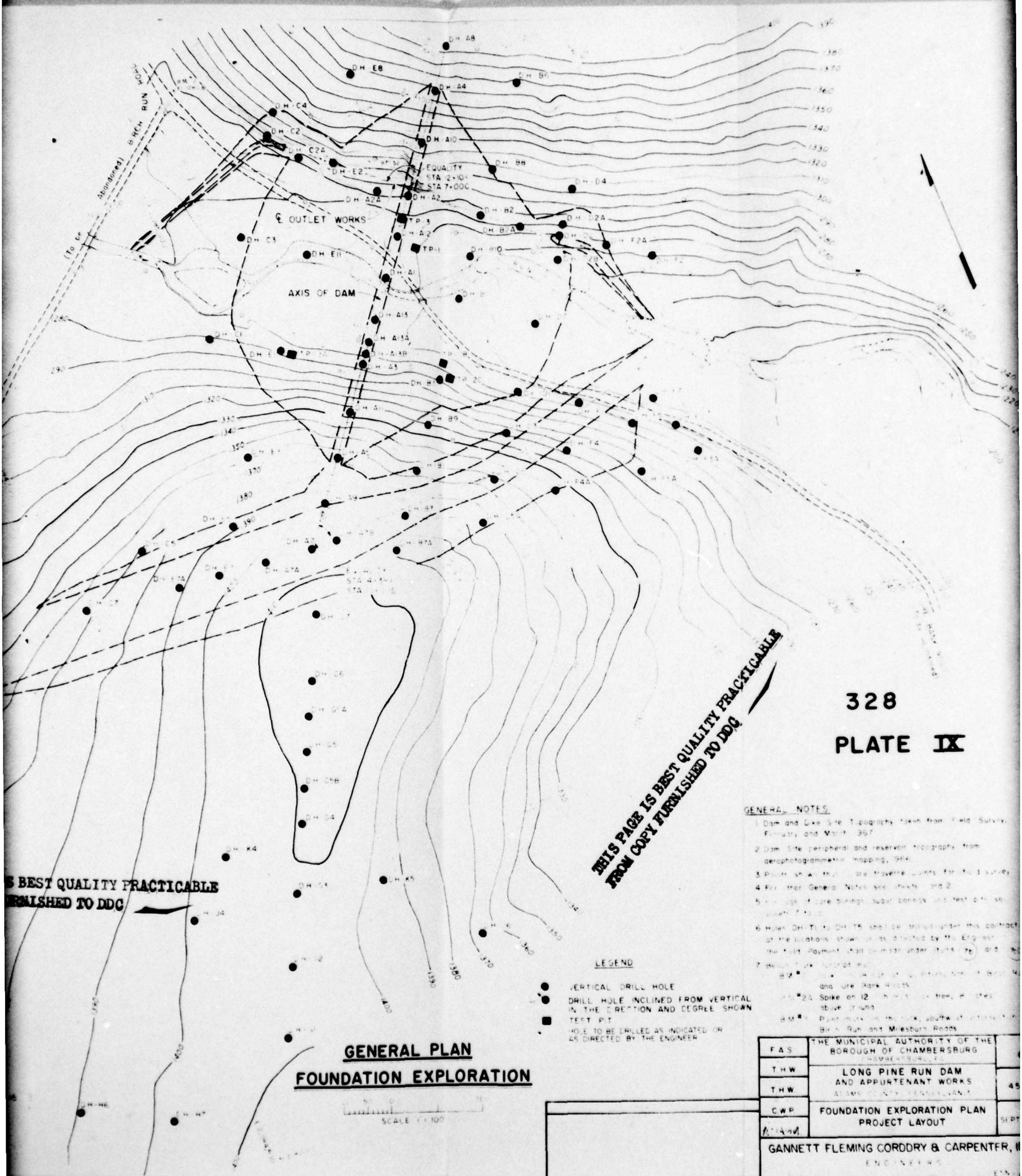

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PLATE IX

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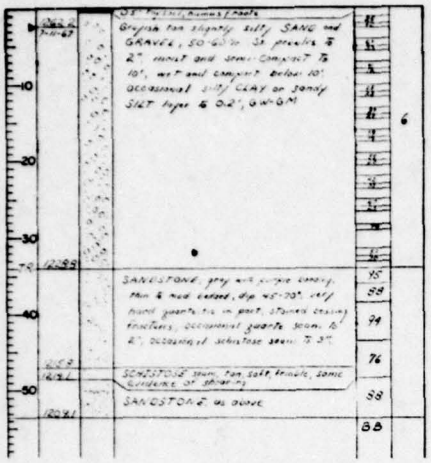
DH-A1
EL. 1262.8



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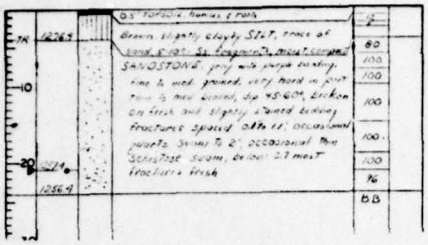
EL. 1280.4



DH-A2A
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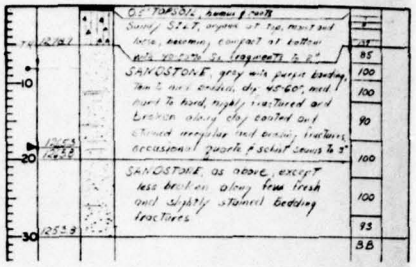

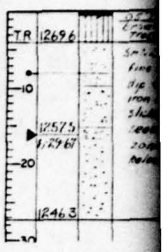

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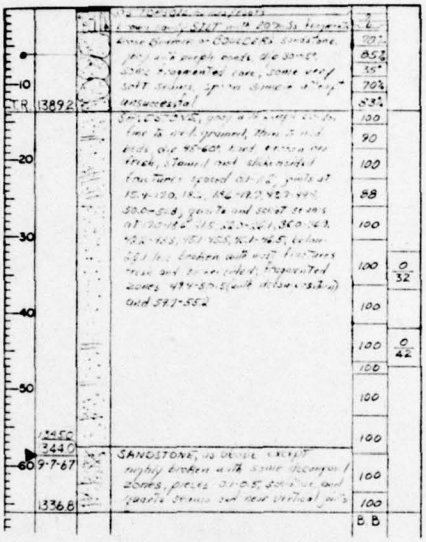
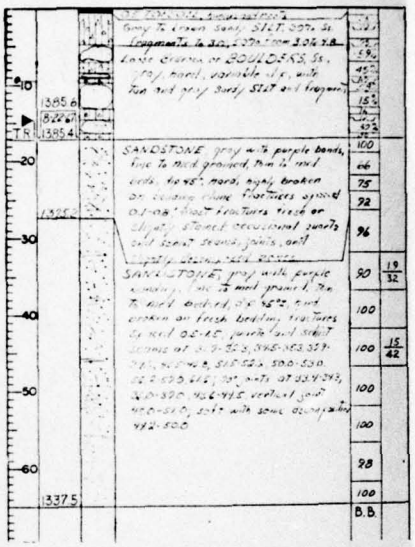
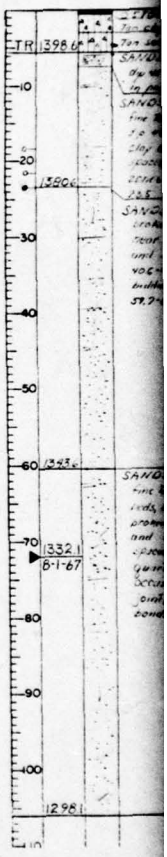
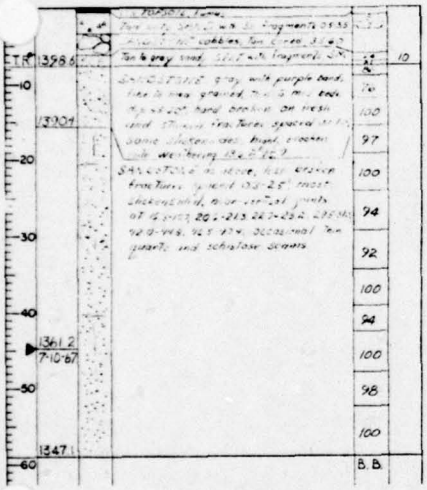


DH-A7B
EL. 1402.5

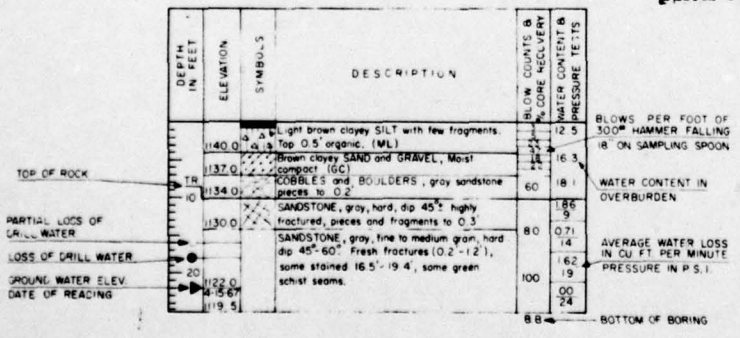




DH-A7
EL. 1406.0



LEGEND



SYMBOLS

OVERBURDEN

- Organic material, topsoil, humus, root
- Silty SAND and GRAVEL
- Clayey SILT
- Sandy SILT
- Sandy SILT with fragments
- Silty CLAY

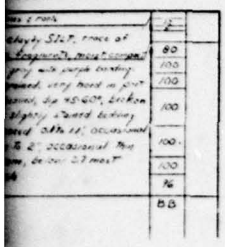
OVERBURDEN

- LOOSE BEDROCK or BOULDERS and COBBLES.

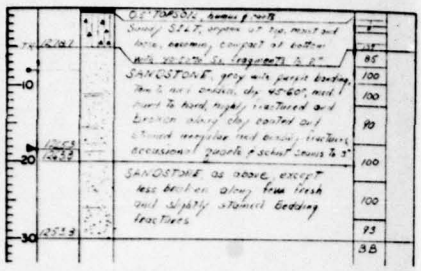
ROCK

- SANDSTONE, QUARTZITIC SANDSTONE.
- SCHISTOSE SANDSTONE.
- SANDSTONE, highly fractured and broken.

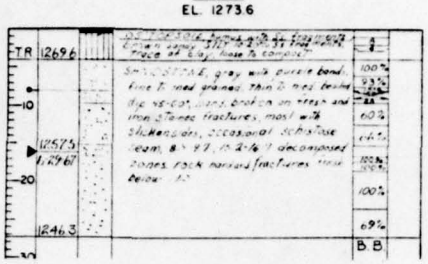
DH-A2
EL. 1280.4



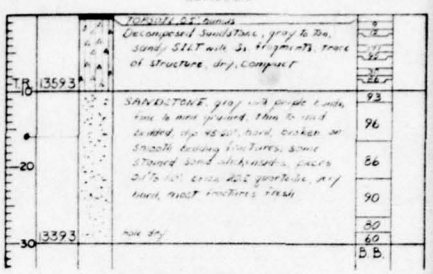
DH-A2A
EL. 1283.8



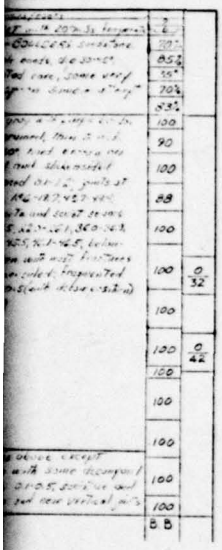
DH-A3
EL. 1273.6



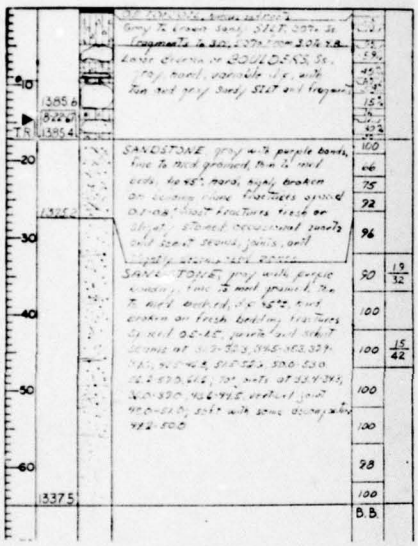
DH-A4
EL. 1369.3



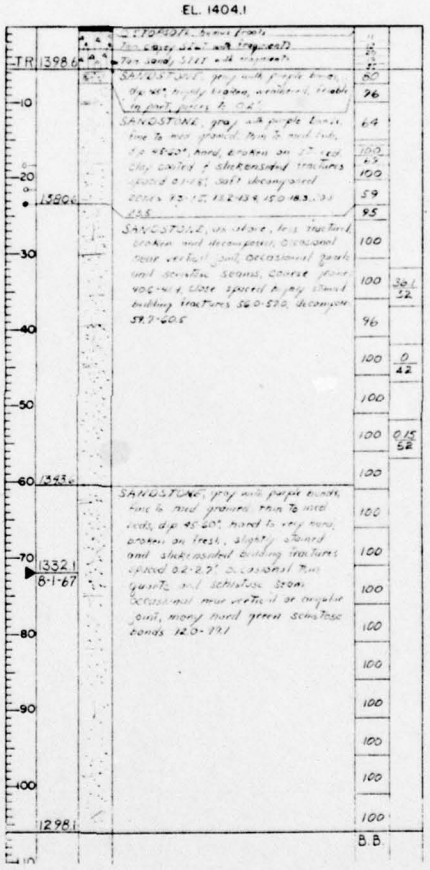
DH-A7A
EL. 1402.8



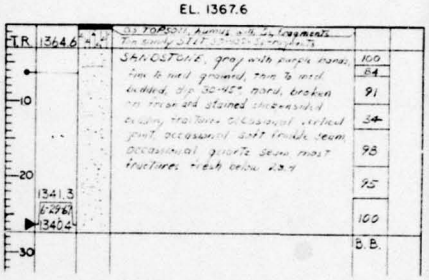
DH-A7B
EL. 1402.5



DH-A8
EL. 1404.1



DH-A5
EL. 1367.6



GENERAL NOTES:

1. Drill holes (DH) were accomplished by drive boring procedure using a 3" I.D. x 2'-6" (±) long spoon (unless otherwise noted) for disturbed samples and a 3" I.D. x 1'-10" (±) long split spoon or 3" Shelby tube for undisturbed sample in overburden. These sample spoons were advanced by a 300# hammer falling 18". However, in some cases the overburden was cored to facilitate advancing the boring. Rock was cored with a (NX) bit.

2. The borings included on these drawings are those in or near the immediate area of the work. Other borings were made outside of the areas shown on plans of foundation exploration. Location information, logs and laboratory data of borings are available for review.

3. Letter symbols, such as GC, SC, CL, are in accordance with the Unified Soil Classification System MIL-STD-619(A) of the Corps of Engineers, U.S. Army.

4. The ground water level shown on the logs represents the level at which water had stabilized in the hole prior to removal of the casing, it is not necessarily the level at which water was first encountered in the drilling operation.

5. Description of soils given on the logs is based on examination of quart size jar samples. Presence of boulders has been noted on the logs when there was a refusal in the driving operation with subsequent coring. It should be noted, however, that in many instances cobbles or even small boulders, may have been penetrated by driving and may not therefore be reflected in the logs of the drill holes. High resistance to driving as recorded in the right hand column of the logs is considered in many cases to be due to a cobble or small boulder.

6. Water contents shown in right hand column of drill hole and test pit logs are the water contents (% of dry weight) of the sample of soil recovered in jars. All water contents are determined on minus 3/4 material unless otherwise noted.

7. Test pits (TP) are machine dug unless otherwise noted.

SYMBOLS

OVERBURDEN

- Organic material, topsoil, humus, root
- Silty SAND and GRAVEL
- Clayey SILT
- Sandy SILT
- Sandy SILT with fragments
- Silty CLAY

OVERBURDEN

- LOOSE BEDROCK or BOULDERS and COBBLES.

ROCK

- SANDSTONE, QUARTZITIC SANDSTONE.
- SCHISTOSE SANDSTONE.
- SANDSTONE, highly fractured and broken.

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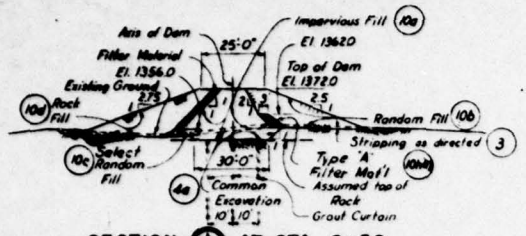
PLATE X

DESIGNED D.S.	THE MUNICIPAL AUTHORITY OF THE BOROUGH OF CHAMBERSBURG, CHAMBERSBURG, PA.	SHEET NO. 7
DRAWN F.J.K.	LONG PINE RUN DAM AND APPURTENANT WORKS	JOB NO. 4562
TRACED G.G.K.	ADAMS COUNTY, PENNSYLVANIA	
CHECKED C.W.P.	FOUNDATION EXPLORATION CORE BORINGS DH-A1 TO A5 DH-A7 TO A8	DATE SEPT 196
APPROVED		

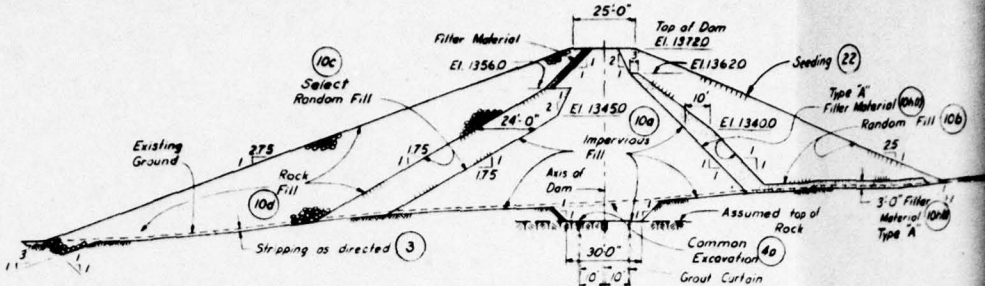
REVISIONS

NO.	DESCRIPTION	DATE	BY

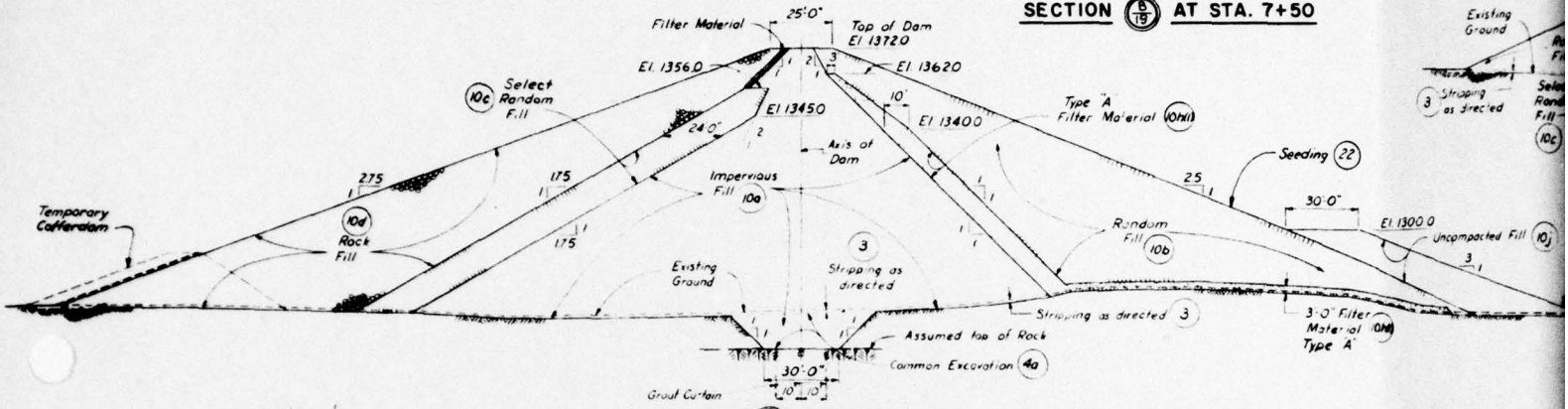
GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS
600 N. SECOND ST. HARRISBURG, PENNA.



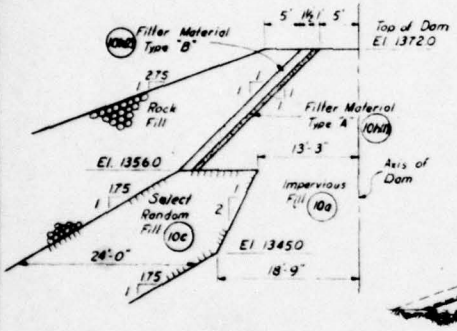
SECTION (A/19) AT STA. 6+50



SECTION (B/19) AT STA. 7+50



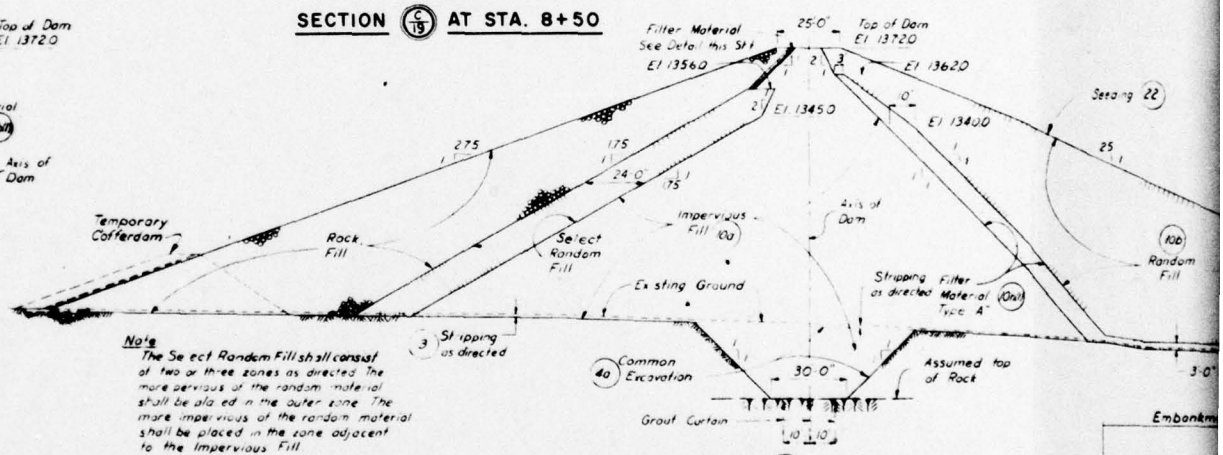
SECTION (C/19) AT STA. 8+50



UPSTREAM FILTER DETAIL

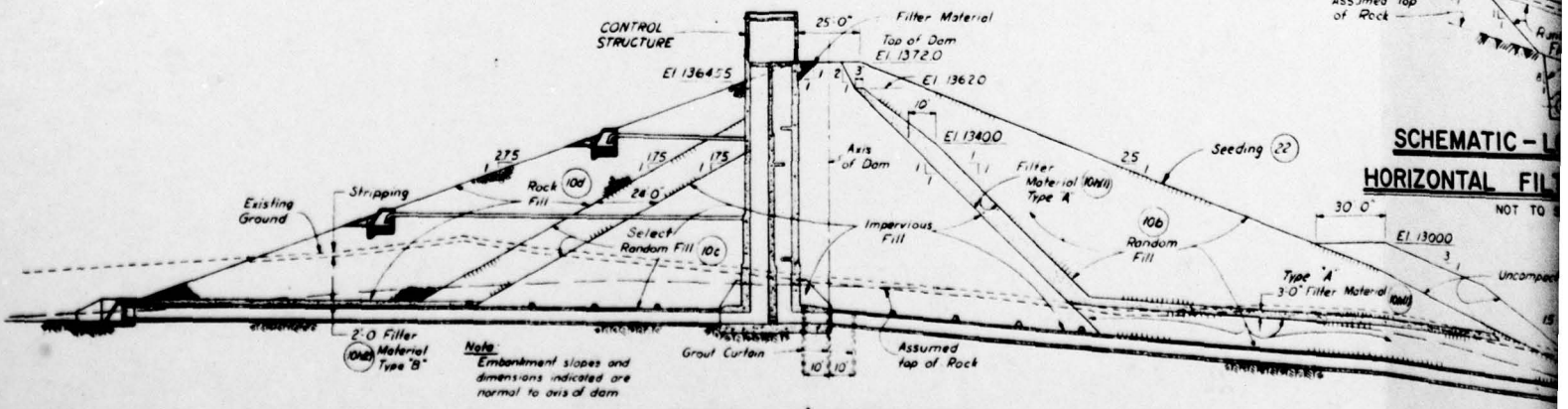
10' 5' 0 10' 20'

SCALE: 1" = 10'



Note: The Select Random Fill shall consist of two or three zones as directed. The more pervious of the random material shall be placed in the outer zone. The more impervious of the random material shall be placed in the zone adjacent to the Impervious Fill.

SECTION (D/19) AT STA. 10+50



Note: Embankment slopes and dimensions indicated are normal to axis of dam.

SECTION AT ℄ OUTLET WORKS

Embankment

Stripping as directed

Assumed Top of Rock

SCHEMATIC – L

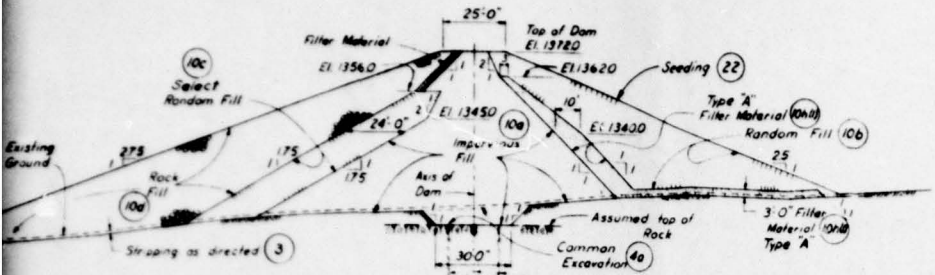
HORIZONTAL FIL

NOT TO S

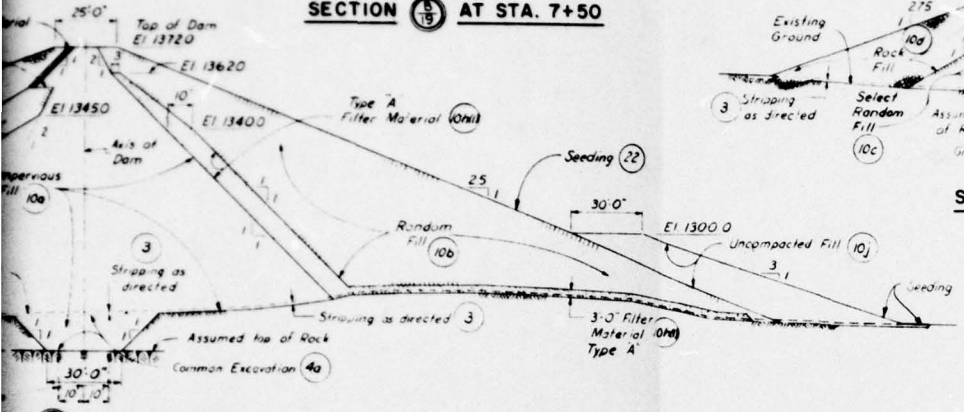
EMBANKMENT SECTIONS

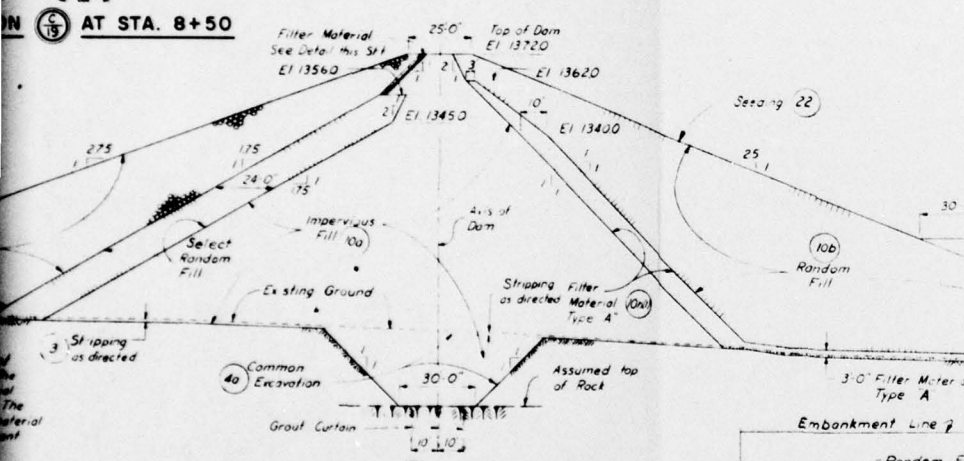
30' 15' 0 30' 60'

SCALE: 1" = 30'

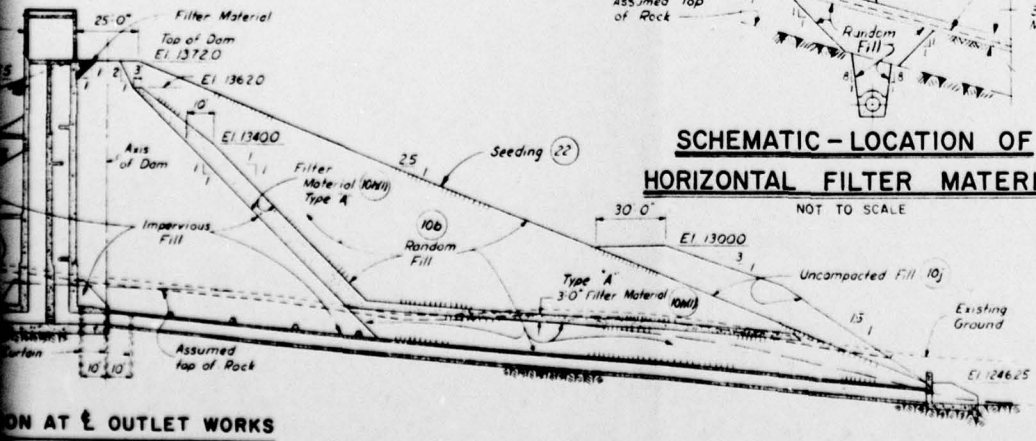


SECTION (B/19) AT STA. 7+50





SECTION (D/19) AT STA. 10+50



ON AT ℄ OUTLET WORKS

ON (C/19) AT STA. 8+50

SECTION (E/19) AT STA. 14+00

SCHEMATIC – LOCATION OF HORIZONTAL FILTER MATERIAL

NOT TO SCALE

GENERAL NOTES:

1. For General Notes, see sheets 1 & 2.
2. For Embankment Surcharge Toe Details, Elevations and other Embankment Details, see sheet 19.

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PLATE XI

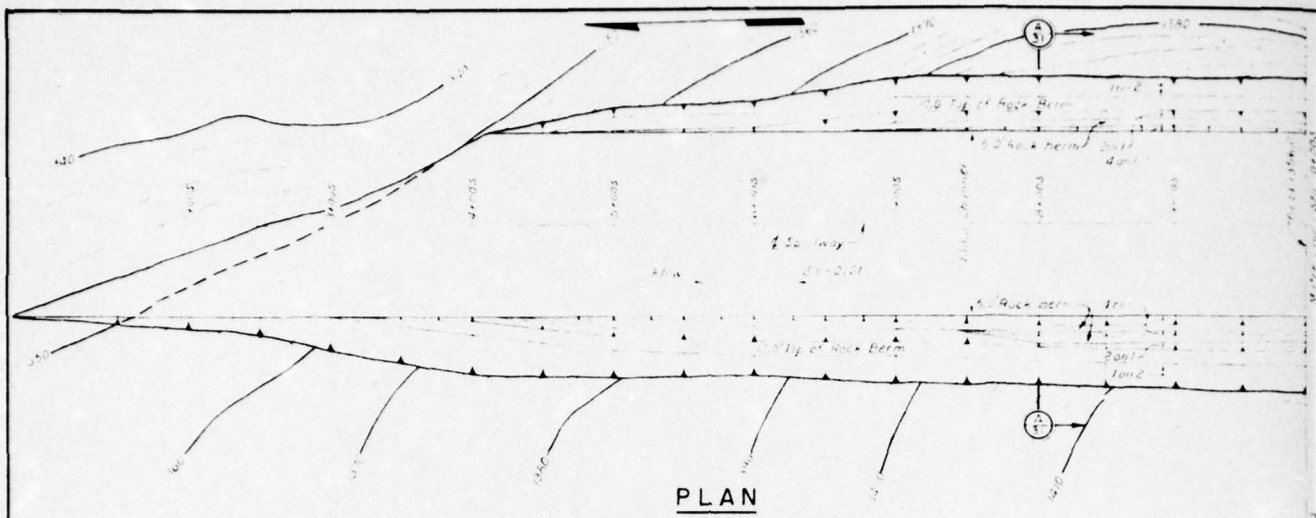
NKMENT SECTIONS

SCALE 1" = 30'

REVISIONS			
NO	DESCRIPTION	DATE	BY

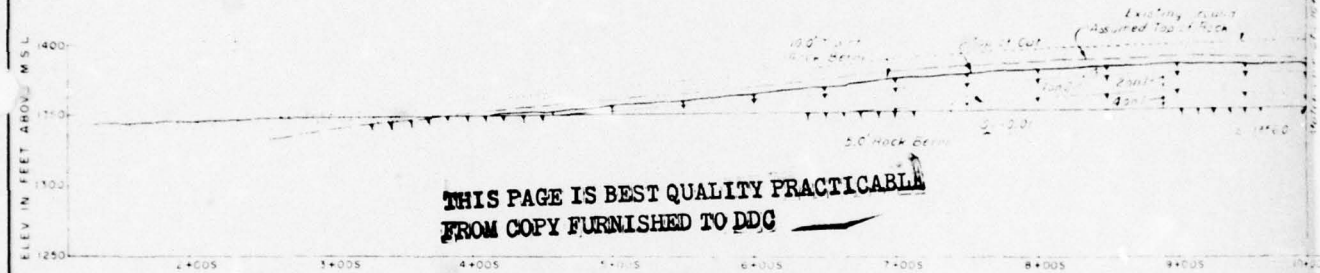
DESIGNED F.A.S.	THE MUNICIPAL AUTHORITY OF THE BOROUGH OF CHAMBERSBURG CHAMBERSBURG, PA	SHEET NO 20
DRAWN W.F.O.	LONG PINE RUN DAM AND APPURTENANT WORKS ADAMS COUNTY, PENNSYLVANIA	JOB NO 4562
TRACED W.F.O.		
CHECKED C.W.P.	ENBANKMENT SECTIONS	DATE SEPT. 1966
APPROVED		

GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS
600 N. SECOND ST. HARRISBURG, PENNA.



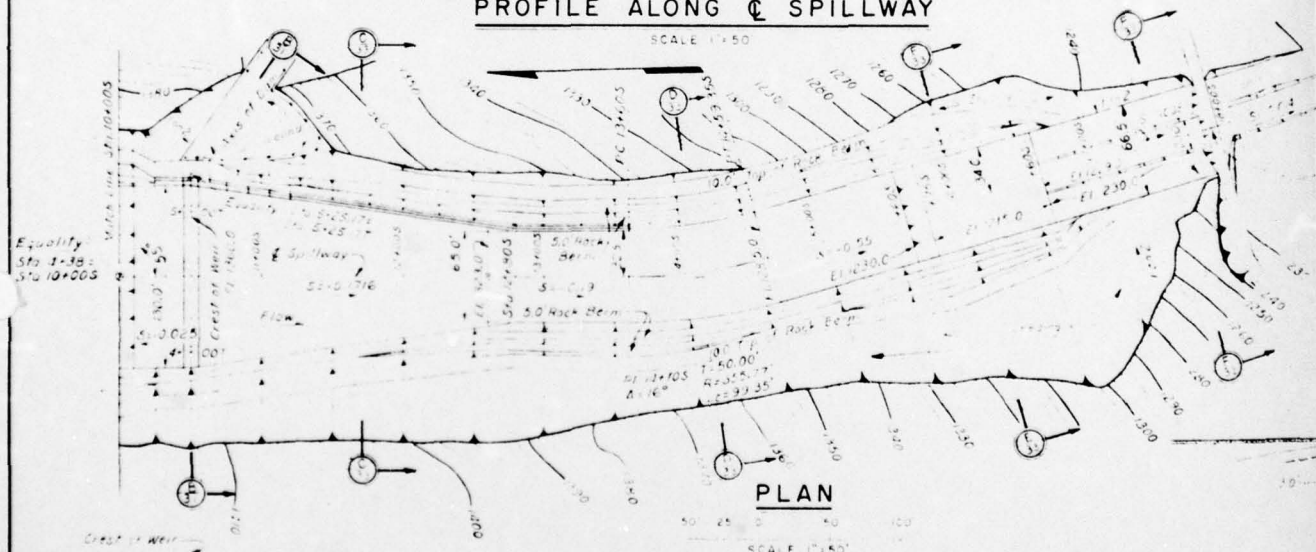
PLAN

SCALE 1"=50'



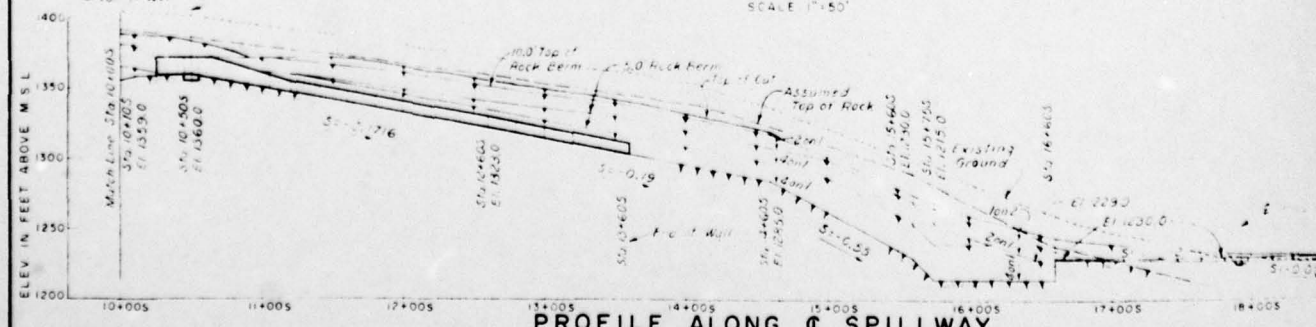
PROFILE ALONG ℄ SPILLWAY

SCALE 1"=50'



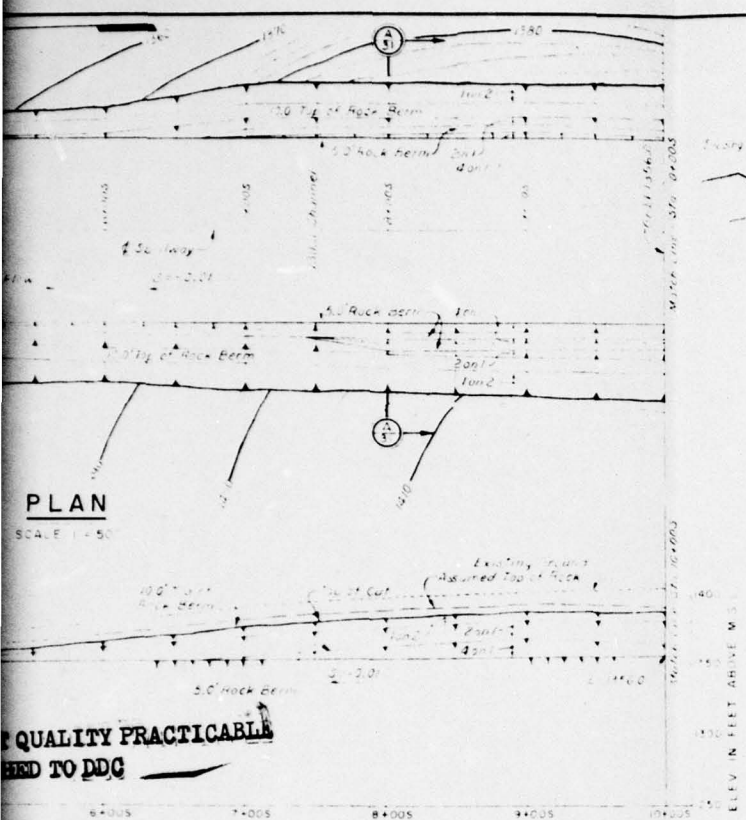
PLAN

SCALE 1"=50'

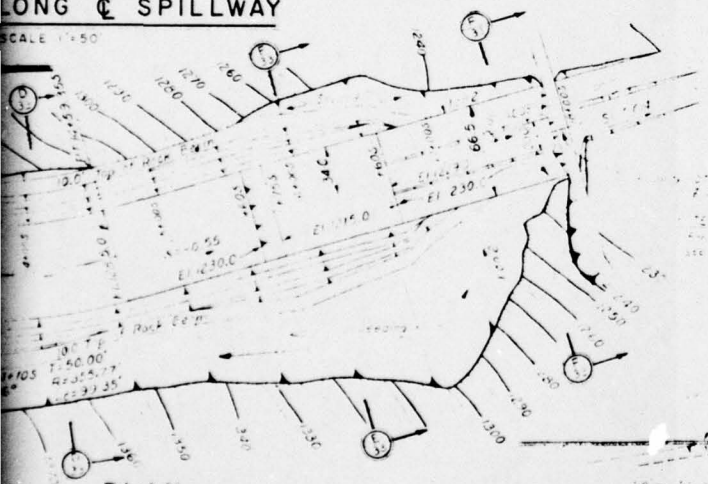


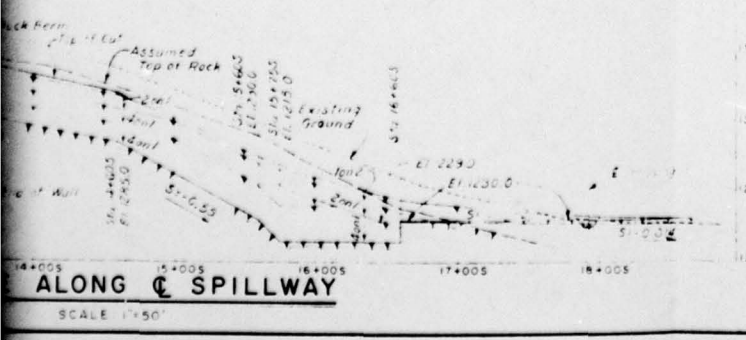
PROFILE ALONG ℄ SPILLWAY

SCALE 1"=50'

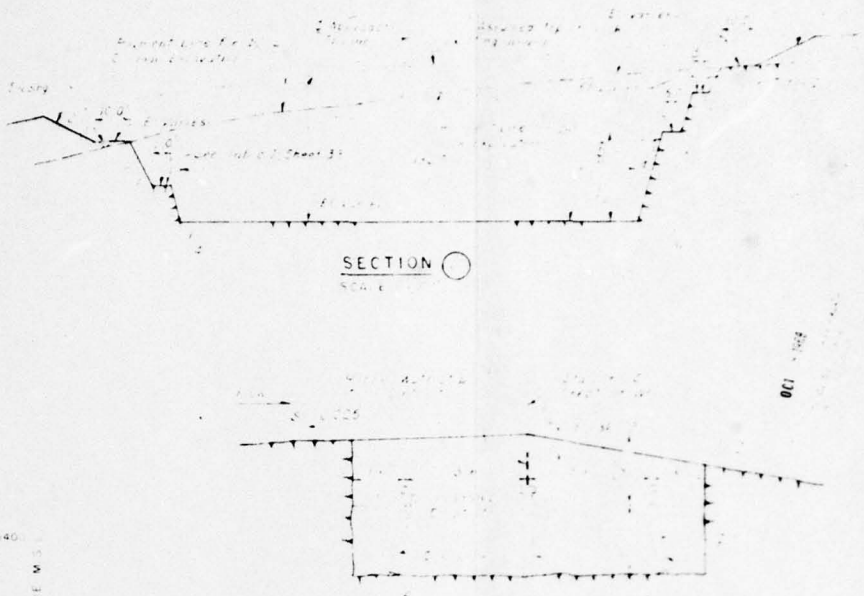


LONG ℄ SPILLWAY
SCALE 1"=50'





ALONG ℄ SPILLWAY
SCALE 1"=50'



SECTION THROUGH WEIR

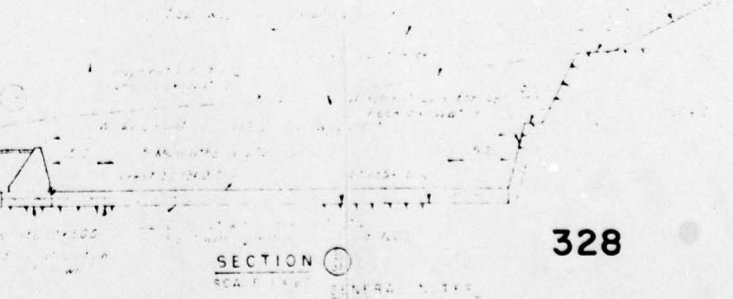


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PLATE XII

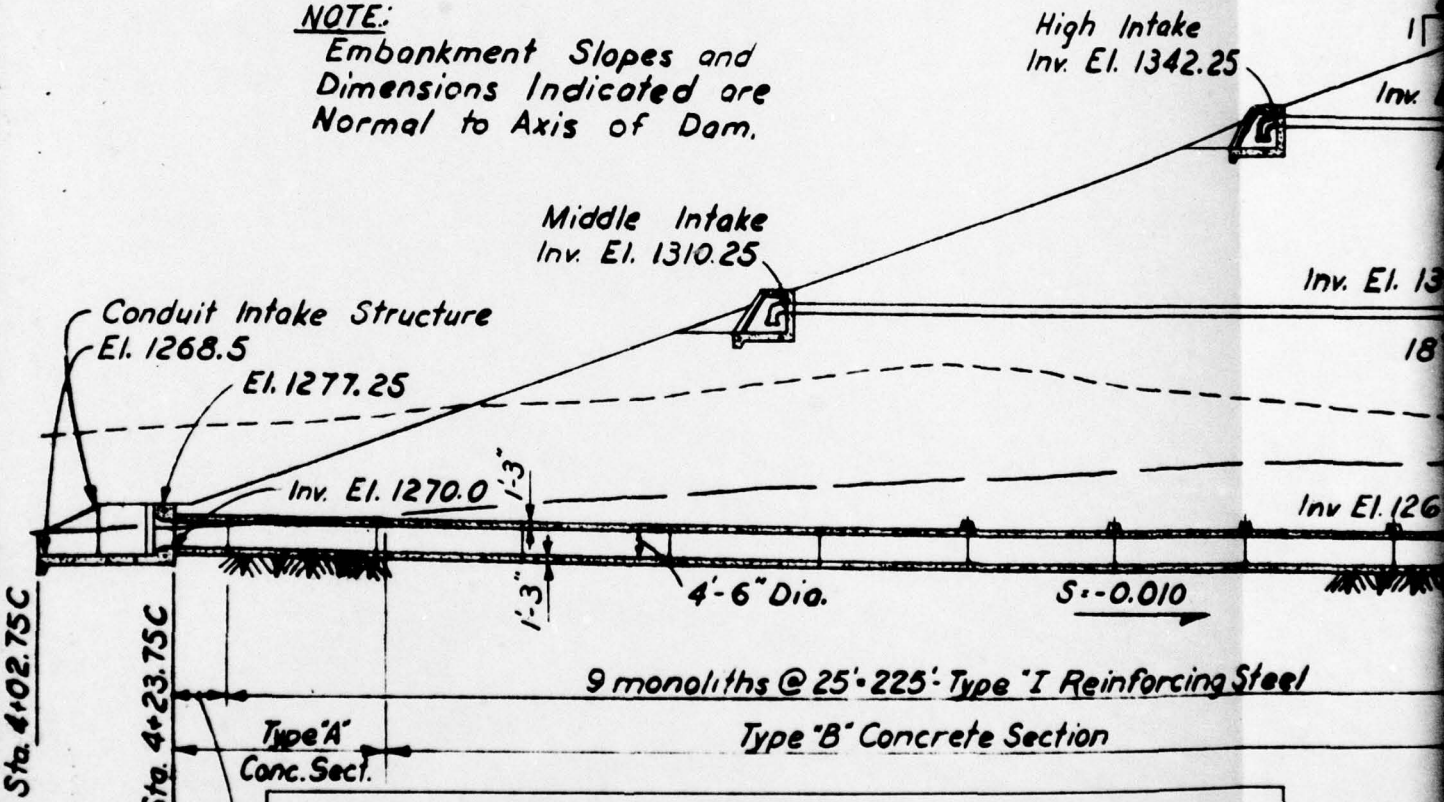
LONG PINE RUN DAM
AND APPURTENANT WORKS
SPILLWAY
PLAN, PROFILE AND SECTIONS

GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS

C-19,109

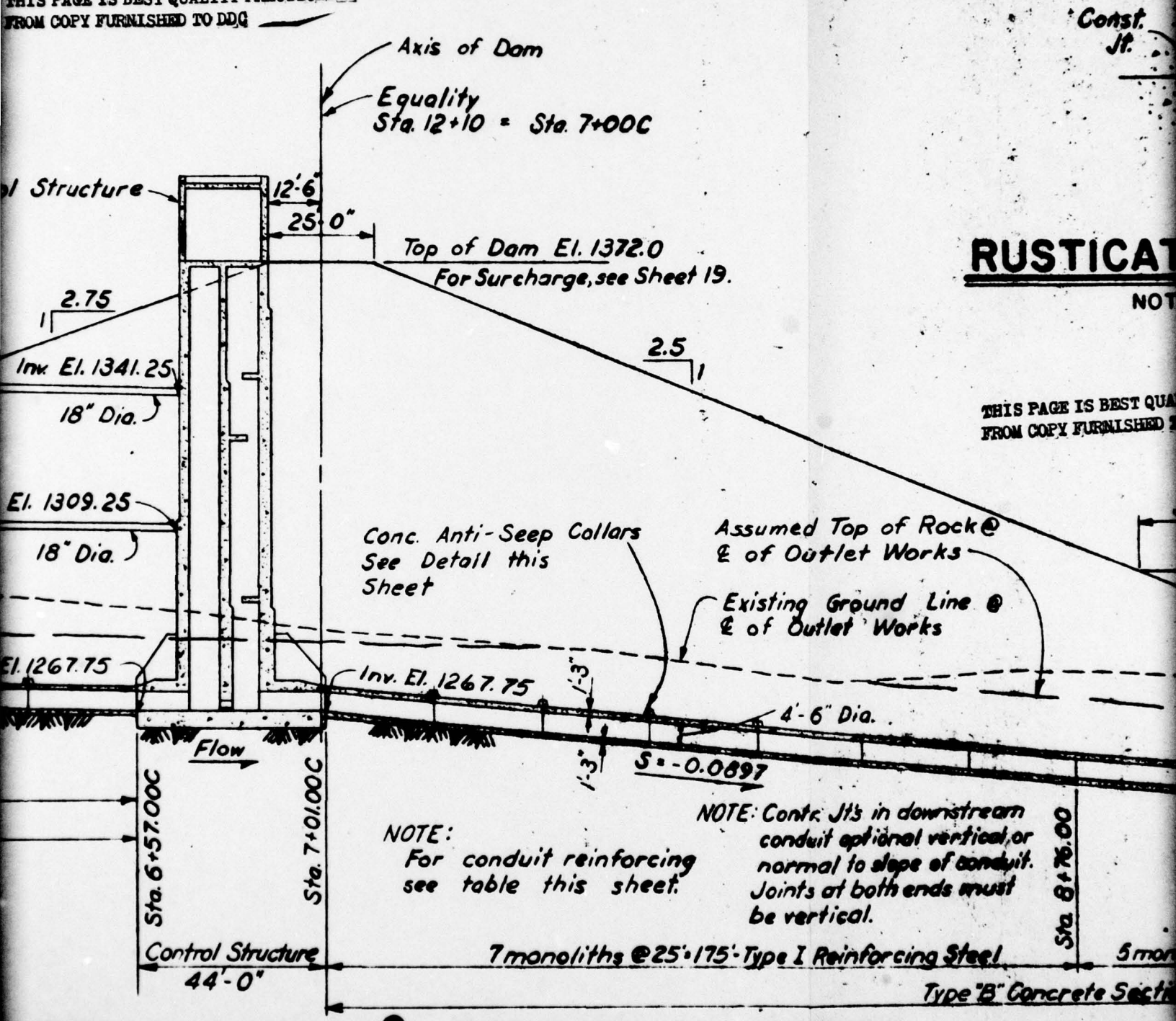
Control Str

NOTE:
Embonkment Slopes and Dimensions Indicated are Normal to Axis of Dam.



CONDUIT REINFORCING STEEL					
TYPE	STATION	BAR DESIGNATION		SPLICE	
		"A"	"B"	"C"	"D"
I	4+23.75 - 6+57.00	"8@12	"9@12	2'-5"	2'-10"
I	7+01.00 - 8+76.00	"8@12	"9@12	2'-5"	2'-10"
II	8+76.00 - 10+27.10	"6@12	"7@12	1'-10"	2'-1"

NOTE: All longitudinal steel "6@12.



RUSTICAT

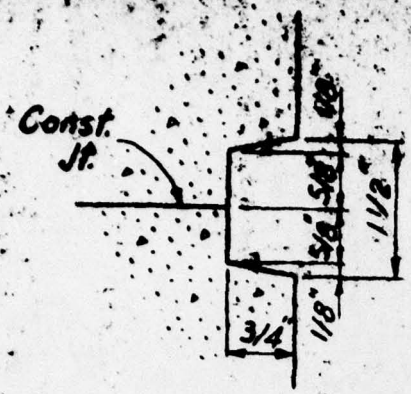
NOT

ROFILE ALONG ℄ OF OUTLET WORKS

30' 20' 10' 0 20' 40' 60'

SCALE: 1" = 30'

2



NOTE:
Rustication all joints above and including El. 1312.0.

Rustication, See Detail this Sheet.

RUSTICATION DETAIL

NOT TO SCALE

THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

2.75 : 1

30'-0"

El. 1300.0

3 : 1

1.5 : 1

...e of Rock @ ...t Works

...ound Line @ ... Works

...ia.

El. 1246.25

Conduit Outlet Structure

Inv. El. 12...

El. 12...25

...in downstream ...tional vertical or ...e slope of conduit. ...both ends must ...el.

Sta 8+76.00

1 monolith @ 26.10'-Type II Reinf. Steel

Sta 10+23.10C

Sta 10+47.10C

...forcing Steel

5 monoliths @ 25'-125'-Type II Reinforcing Steel

Type "B" Concrete Section

Type "A" Concrete Section

SIDE EL...

SCALE: ...

...KS

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PLATE XIII